

# DISCOVERY

A MONTHLY POPULAR JOURNAL OF KNOWLEDGE

Edited by JOHN A. BENN

Volume IX

JANUARY TO DECEMBER

1928

LONDON

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# DISCOVERY

## A Monthly Popular Journal of Knowledge

Vol. IX, No. 97.

JANUARY, 1928.

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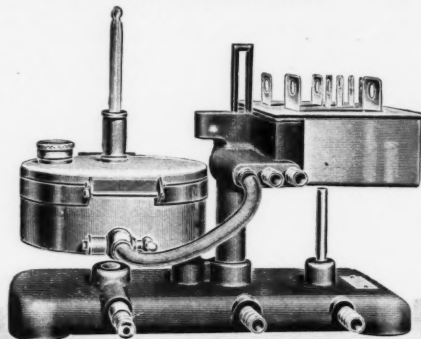
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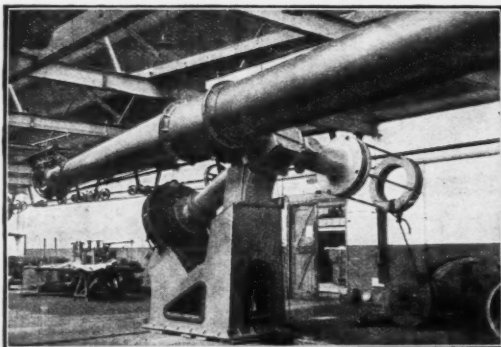
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# DISCOVERY

A Monthly Popular Journal of Knowledge

Vol. IX. No. 97. JANUARY, 1928.

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Publishers: BENN BROTHERS, LTD. All communications respecting editorial matters to be addressed to the Editor; all questions of advertisements and subscriptions to the Manager.

Offices: Bouverie House, Fleet Street, London, E.C.4.

Telephone: City 0244 (10 lines).

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## Editorial Notes.

AT the moment when the report of the international committee of inquiry into the Glozel discoveries is eagerly awaited, by specialists and the public alike, we feel it a matter for congratulation that *Discovery* is able to publish the views of M. Reinach. Except for a few articles that have treated the problem in a general way, there has not hitherto appeared in England an authoritative statement giving the case of those who regard the discoveries as genuine. One of those competent to speak, Mr. O. G. S. Crawford, has in no unqualified terms given the views of a sceptic, in a recent article in the press, and we believe it desirable that those of the opposite opinion should have an equal opportunity for expression. As director of the museum at St. Germain-en-Laye, M. Reinach has been keenly interested since the Glozel finds first came to light, in 1924, and he has personally made enquiries on the site of the excavations. Up to the present time, no less than three thousand objects have been unearthed, and M. Reinach questions whether such quantities of material could possibly have been faked. The most interesting feature of the problem is the hieroglyphics with which many of the objects are marked, these showing a mixture of various ancient scripts that the experts recognize and a number of unknown characters. We do not at present propose to offer any opinions on the Glozel discoveries, except to suggest that, however convinced

the one side may be that the other is mistaken, it would be well to keep an open mind until the full results of the inquiry are available. It is not improbable that the committee's report will come as a surprise to many of those who have followed the controversy in all its stages.

\* \* \* \* \*

We have received the suggestion that a party might be organized to visit Glozel early in the spring. It is pointed out that, although this hamlet is not far from Vichy, the reports indicate that there are difficulties in reaching the site cross-country, apart from the uncertainty of individual travel arrangements. From inquiries we have made, it appears that not less than twenty-five persons can secure special railway facilities and while we could not ourselves undertake the organization, we should be pleased to hear from any readers interested in the scheme. Travelling towards the end of February, such a party might be accommodated for a week's tour at an inclusive cost of about eleven guineas a head.

\* \* \* \* \*

It is always to be regretted when scientific controversy descends to personal aspersions, and the case is the more unfortunate when international considerations are involved. From the correspondence published in its journal, it is clear that the Royal Geographical Society had no alternative than to accept the resignation of Captain Amundsen, who declines to withdraw his imputations of discourtesy on the part of the late Marquess Curzon, then president of the Society. While there is no excuse for a charge based on an inference that Amundsen alone imagines to have been contained in a speech, at a dinner given in his honour, the case is different when he also casts aspersions on a brother explorer. We publish on another page a statement by Captain Wilkins, the leader of the American Airplane Expedition to the Arctic, in which he defends some discoveries of Stefansson that have been disputed by Amundsen. In the autobiography that contains the offending

passage about Lord Curzon, there also appears a charge of dishonesty against Stefansson which, however, has a significance of quite another kind. In suggesting that certain "discoveries" were never made, Amundsen unfortunately again introduces personalities, but he also questions a matter of importance to explorers—whether it is in fact possible to live by hunting on the Arctic sea-ice. We therefore gladly print Captain Wilkins' rejoinder, as he accompanied Stefansson on the disputed journey.

\* \* \* \* \*

It has become so very usual to regard the condition of the iron and steel trades as scarcely better than that of the coal industry, that special attention may be drawn to a progressive development in Sheffield. On another page, our representative describes the inauguration there last month of a new type of electric furnace, which in order to demonstrate its heat efficiency was enclosed for the occasion in a wooden box. By contrast with the old crucible process, the heat is induced by a high-frequency current passing through the metal itself, so that the contents of the furnace do not come into contact with the fuel. One of the obvious disadvantages of the processes at present employed is that the crucible becomes porous under the heat to which it is itself subjected, and various contaminating materials penetrate into the molten metal. In addition to this improvement, the new apparatus does not appear to cost more in current consumption than the ordinary electric arc furnace. By an interesting connexion, it has been installed at the works where, in 1909, the first electric steel furnace was introduced into England.

\* \* \* \* \*

We have just received the 1928 prospectus of the Imperial College of Tropical Agriculture, with the principal's report for the past year. Since the arrival of additional staff in Trinidad it has been found possible to extend somewhat the research programme, and good progress has been made. The main crops on which investigation has commenced include the banana. Acting on the recommendations of Dr. A. W. Hill, the Empire Marketing Board agreed to give a recurring grant of £2,000 for five years and a capital sum of £2,350, to provide the necessary buildings and equipment for research on this fruit, and plans for carrying out detailed cold storage experiments are now being considered. Trials with immune varieties have been continued on a field scale, and in addition to the Governor and the Giant Fig, which have continued to yield heavily and exhibit immunity to the Panama disease, two other varieties, Lacatan and Bumelian, have come into prominence, and their cultivation will

be extended. Unfortunately these varieties are not entirely suitable for the present methods of transport on a commercial scale, but cold storage and packing experiments may overcome this disadvantage.

\* \* \* \* \*

Further important objects have been unearthed at Beisan by Mr. Alan Rowe, who is working on behalf of the Museum of Pennsylvania University, and he will shortly contribute to *Discovery* an account of the expedition. Meanwhile, it is reported in *The Times* that he hopes to continue the clearance of the two Canaanite temples of Pharaoh Thothmes III, the middle portions of which only have so far been excavated. From the evidence of the brick pedestals on most of the very low walls of the temples, it would appear that the buildings themselves were screened in with wood; the roofs also were of wood. This screening with wood is very interesting, and is said to be entirely unknown elsewhere in Palestine.

\* \* \* \* \*

In his Royal Institution lectures on the application of X-rays to the study of crystal structure, Sir William Bragg dealt with a new principle lately evolved, which is of special interest in its application to the study of the silicates. These compounds consist of elements that compose more than nine-tenths of the earth's crust, and the new method of analysis shows that oxygen makes the framework of all these substances. Just as a tapestry consists of woven threads, on which intricate patterns may be placed, so the oxygen atoms are piled tightly together like spheres of uniform size. The other atoms are placed in the interstices, according to a regular design which varies from substance to substance. Sir William proceeded to develop this ingenious analogy, describing how it sometimes happens that the stronger atoms are a little too big for the holes between the oxygen atoms. In this case the regularity is impaired, just as a material "pulls" if that which is embroidered on it is too hard, and takes charge of the pattern.

\* \* \* \* \*

The Royal Commission on Ancient and Historical Monuments and Constructions of Scotland has recently completed its survey of the romantic Outer Hebrides, Skye and the Small Isles. The country surveyed is remote and difficult to traverse, but at the same time of great archaeological interest. The commission's inventory will be copiously illustrated with plans and photographs, and a special feature is its record of the numerous cairns, stone circles, fortified sites, and earth-houses. Much of the material is recorded here for the first time, and H.M. Stationery Office hope to issue the volume very shortly.

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## Why I Believe in the Glozel Discoveries.

By Salomon Reinach.

Director of the Museum of Saint Germain-en-Laye.

*While it would be premature for DISCOVERY to express opinions on Glozel pending the report of the committee of inquiry, we believe it desirable that both sides of the question should be presented. We therefore offered space to one of the leading French archaeologists who regard the discoveries as genuine. "If I am not mistaken or deluded," M. Reinach concludes, "a new phase has begun in the study of early civilization."*

Two causes have brought to the fore the hitherto very obscure name of Glozel, a small hamlet about eighteen miles from Vichy, near the rivulet Vareille, which flows into the Sichon: a big discovery and a big quarrel. The discoveries began in 1924; the quarrel has been particularly intense in 1927, and has not yet been settled as I write. It is almost a rule, in the history of science, that every new departure involves some sort of a fight. Science, as condensed in handbooks, resembles a human organism which revolts against the intrusion of foreign elements and strives to reject them. People either say "that is nothing new," or "it is all a hoax." In the case of Glozel, the former opinion is that of M. Camille Jullian; all the polished stones, the vases, the inscriptions, the trinkets, he considers as the paraphernalia or *bric-a-brac* of a Gallic witch, about A.D. 400, and he tries to force a late-Latin key into texts, three thousand years older at least, which can neither be deciphered nor translated.\* The latter opinion is that of S. de Ricci, Crawford, Vayson, Dussaud, Bégouen, and perhaps (because he has contradicted himself), the Abbé Breuil: *it is all a hoax.*

### Three Thousand "Fakes"?

When asked who was responsible for the faking of 3,000 objects, not one of which reproduces a known type, the answer is: "The Spirit of Glozel," or "That is not our concern, call for the police!" Of course, this all means that the faker is the finder, Dr. Morlet, a most honourable physician at Vichy, or his young help, the peasant Emile Fradin (born 1906), grandson of the farmer who is in possession of Glozel; but fearing to be prosecuted by the French courts, people talk of the "Spirit of Glozel," who, being non-existent, cannot lodge a complaint for libel!

After much dispute, the international Congress of prehistory, meeting at Amsterdam, authorized its bureau — president, vice-president, and secretary — to

nominate an international committee for investigating the matter. The inquiry was held at Glozel last November and the six delegates, one of whom was Miss Garrod, were left free to excavate as they pleased. Types of almost every object were discovered; but the report of the committee has not yet come out (12th December).

### The Site of the Finds.

The site in which the discoveries have been made—first by chance, March, 1924, later on by very careful and slow digging—is a small plateau, dominating the Vareille rivulet, called *Les Durantons*. Not a third of the whole has as yet been explored, and the nature of the early establishment remains doubtful: necropolis or sacred ground, full of votive offerings? Though two and perhaps three tombs have come to light, human remains are rare; the latest opinion is that we are in presence of a cemetery in which partial cremation was practiced. Till the whole plateau has been cleared, it seems wiser to state no definite opinion.

The offerings, very few of which may have been of any practical use, are in great numbers; as not the tiniest fragment of metal, nor of Celtic or Roman pottery, has been discovered, and as the imperfectly polished axes and flat rings in hard stone belong to the very beginnings of Neolithic times, the date must be a very early one (3000-4000 B.C.). Such vases as present some analogy with the so-called *owl-vases* of Troy—eyes, heavy eye-brows, a nose, but no mouth—are very much ruder than the Trojan ones. On the other hand, the engravings of animals on pebbles, flat stones, and rings are, though very degenerate, unmistakably akin to the Magdalenian ones, so that if, as I think is necessary, the date of La Madeleine is somewhat brought down, that of Glozel must be very near the close of the Pleistocene times in that part of France. Another cogent argument to the same effect is the existence of at least two engravings representing reindeers, an animal which was believed to have been extinct before the beginning of the Neolithic, and whose co-existence with primitive

\* Stupendous examples of such enforced readings have appeared in the *Revue des Etudes anciennes*, 1927.

pottery has been repeatedly denied. But what of the co-existence of the reindeer with a very developed linear script, with inscriptions on clay, one of which numbers over one hundred signs? That is really the crucial point, the great surprise and the sole excuse for so persistent a scepticism.

### Early Excavations.

In truth, that revelation was not wholly unprepared. As early as 1865, Lartet and Christy, digging in the caves of the Dordogne, found bones bearing signs which they considered as at least tentative writing; others, with longer series of signs, have been discovered since, and several of them are like the signs from Glozel. The French archaeologist Piette, digging near the Pyrénées, unearthed painted pebbles bearing unmistakable characters, and that caused him to declare in 1896, with truly prophetic insight, that writing had been first practiced at the end of Pleistocene times and that the Phoenician alphabet, far from being the ancestor of all others, was an extract, cleverly made by acute tradesmen, from very numerous alphabets of western origin. As early as 1891, indeed, a Portuguese scholar, Estacio de Veiga, had vindicated the local character of the Iberian script, which most scholars derived from Phoenicia. The discovery, first published in 1903, of inscriptions, rude reliefs, and still ruder sculptures discovered under a dolmen of the most primitive type at Alvão in Portugal, seemed to point in the same direction; but those finds, astonishingly similar to the Glozelian ones, though rather later, were rejected as forgeries. A few German archaeologists, in particular Wilke (1912), believed in them, and maintained that they proved the truth of Piette's theory, adopted in 1903 by R. Severo, the clever and unjustly treated editor of the Alvão inscriptions and carvings.\* But, with a few exceptions, Piette, Severo and Wilke were regarded as dreamers, and little attention was paid to their writings even after Sir Flinders Petrie (1912) had accepted the hypothesis of early Mediterranean alphabets. Excepting the Portuguese scholar, Leite de Vasconcellos, who went to Glozel in 1926, and myself, nobody seemed to remember Alvão when I showed to the French Academy engravings of those important finds (10th September, 1926). Severo's paper, lost in an extinct periodical, *Portugalia*, ought to be translated and circulated; it is an admirable piece of research work.

The inscriptions found at Glozel have not all been

\* One Englishman, the Rev. Du infield Astley, also believed in Alvão; R. Munro remained in doubt.

published; but pictures of a number of them—mostly on clay tablets, some on stone and on vases—may be found in the four pamphlets issued by Dr. Morlet and also in the files of the *Mercure de France*, a well-known Parisian magazine, the directors of which were the first to believe in Glozel and to give large publicity to Dr. Morlet's discoveries and writings. I may add that the best general article on the whole question has recently been published by Professor Audollent, Dean of the University of Clermont, in *Le Correspondant* (10th November). M. Audollent repeatedly visited the excavations and, like MM. Espérandieu, Loth, Depéret, and myself, members of the French Institute, and like many eminent French and foreign scholars, witnessed the prudent extraction of all sorts of objects from the yellow bed of untouched clay, at the depth of two feet or so beneath the surface. With the solitary exception of S. de Ricci, who passed there only one morning, all the *unbelievers* never saw an excavation going on; Abbé Breuil excavated under pouring rain and found almost nothing. M. Jullian did not even pay a visit to the museum in the farmhouse at Glozel!

To return to the inscriptions. There are more than a hundred different signs, half of them quite new to us, the remainder offering analogies, which amount often to identity, with the Phoenician, old Greek, Etruscan, Latin, Asiatic, Cretan, Cypriote, Iberian, and Libyan scripts. But, as I first recognized,



CLAY TABLET UNEARTHED AT GLOZEL.

This photograph shows one of the finds made in M. Reinach's presence, while he was inspecting the site. The inscriptions are now under discussion.

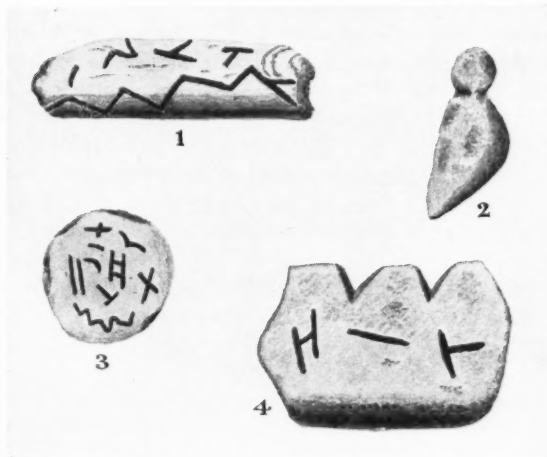
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the letter B is not to be found, no more than in the Iberian and Etruscan alphabets; moreover, a letter consisting of two opposed triangles, X, which occurs in Iberian and in one archaic Greek alphabet, is frequently met with at Glozel. Another familiar letter is T, with two perpendicular bars, only known hitherto in Halicarnassus, where it seems to have sounded *ts*. Imagine a forger—either a medical man or a young peasant—studiously avoiding to write B! As I have often said, that argument, if it were the only one, would suffice to prove that all that epigraphical treasure is genuine.

The engraving on imperfectly burnt clay is some-

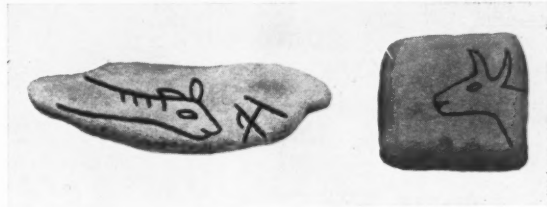


OTHER TYPICAL DISCOVERIES.

These pictures, specially painted for *Discovery*, are based on M. Morlet's line drawings. (1) A piece of bone, inscribed with "letters" and a geometrical design. (2) A stone pendant. (3) A pebble disc, showing nine alphabetical signs. (4) A fragment of flaked stone, cut with notches and inscriptions.

times very clear, though irregular, sometimes rather awkward; the inscriptions on stones or vases are always short, but carefully carved, and certainly with the help of a pointed stone, not with any metallic implement.

Another great surprise was the discovery of more than a dozen clay figures, representing a human face, without a mouth, and the organs of both sexes, one projecting, the other rudely excavated in triangular shape. Nothing like these hideous "idols" has come to light anywhere else. The *unbelievers* are compelled to resort to Freud and to suppose that the youthful forger—a very nice chap—is sex-mad! Such nonsense has even gone into print. Some vases recall the aspect of a dead man's head, with great round eyes, the mouth being always lacking. Dr. Morlet supposed that they were symbols of ever silent death. As the



ANIMALS' HEADS CUT IN STONE.

Two pebbles found at Glozel, one cut with a deer's head, the other depicting an ox. They may have been engraved for hunting purposes.

general shape of these vases is that of a head, I prefer to believe that drinking out of skulls may have been one of the origins of pottery. The baking of the clay is, however, so deficient, and the opening so small, that I do not think any of these vases ever served a purpose; like the *impossible* arrow-heads and harpoons—some of them inscribed—and many other things, they were purely votive or funeral, which amounts in so remote times to the same thing.

To sum up. In the obscure period between Palaeolithic and Neolithic, perhaps only in mountainous regions, the reindeer survived and the reindeer hunters also. They had other animals (not yet domestic) and began to cultivate the land; they were inferior artists, but still engraved outlines of animals, for magic or hunting purposes; they used pottery and developed a complicated linear script. Their peculiar civilization was probably common to what we now call France, Spain, and Portugal, but extended to others regions both North and East. Later on, in the Megalithic era, not a trace of that culture remained in France; its bearers must have migrated to the East, following perhaps the Mediterranean shore or the valley of the Danube, under pressure of Northern invaders. How their writing, and also something of their arts and crafts reached the Aegean, we do not know and cannot guess. But the facts are there, and may help in due time to explain some faint traces of scripts in other countries with which the Glozelian culture may have come in touch, rock-carvings in Sweden and in Northern Africa, engraved signs at Tordos in Transylvania, others on Thracian and Trojan pottery, etc. We must look out for such signs with more attention than has been done hitherto, especially in Spain, where we know that the Neolithic culture was very brilliant and spread to Ireland as well as to the North and East of Europe. That means, if I am not mistaken or deluded, that a new phase has begun in the study of early civilization, and that the old saying *Ex Oriente lux* must now—at least before 1500 B.C.—be discarded as prejudice, for the benefit of Western Europe.

## New Light on Oceanic Migrations.

By James Hornell, F.L.S., F.R.A.I.

*Late Director of Fisheries to the Government of Madras.*

*Research on the types of canoe found in the widely-scattered islands of the Indo-Pacific region indicates that oceanic migrations took place there centuries before the historic "pioneer" navigations. Magnificent kingdoms undoubtedly existed of which even the names have been forgotten.*

IT has long been customary to regard the Phoenicians and Carthaginians as the pioneers of oceanic exploration and traffic; they have been credited with voyages to the Pacific and even to the western coast of South America. The merit of their pioneering cannot be gainsaid; they circumnavigated Africa, they trafficked with our British ancestors for tin and may even have worked Cornish mines themselves; they knew the centres where Baltic amber was to be procured, and, a thousand years before our era, at the head of the Red Sea, it was the Phoenicians who built and officered ships of commerce for King Solomon wherewith to open direct trade with emporia on the shores of the Indian Ocean.

### Early European Limitations.

They could steer a course by the stars when in well-known waters, but there is no evidence that they did so elsewhere than in the Mediterranean; when voyaging round Africa they tethered their ships to trees at night lest they should drift away in the darkness into the unknown. But that their ships went further afield than the shores of the Arabian Sea—even that only on exceptional occasions when employed by a ruler having an outlet on the Red Sea—is a figment of fancy. One fact alone makes it impossible. The Phoenicians, equally with the Carthaginians, were purely a Mediterranean power when independent, without a maritime base of their own on the shores either of the Red Sea or the Indian Ocean; without one it would have been madness for them to have attempted to carry on commerce under their own flag in foreign waters, where their fleet would be constantly at the mercy and caprice of the ruler of the land through which reinforcements for the ships would have to pass. If it had been otherwise, why did Solomon go to the trouble and immense expense of having ships built at Ezion Geber (the modern Akaba) by the Phoenicians instead of chartering some of their Indian-voyaging merchantmen? The fact that he built instead of chartering seems conclusive evidence that no such Phoenician fleet did exist. On the other hand there is every probability that Phoenician traders voyaged along

the coasts of the Indian Ocean in local craft, Egyptian, Arabian and Indian, carrying their goods southwards towards the Zambesi, and eastwards to India and the Golden Chersonese, in search of gold and precious stones and pearls.

The first historic record of genuine ocean travel dates to the time when Greeks and Hellenized Egyptians had taken the place of the Phoenicians as sea-traders; the discovery of the value of the monsoon winds of the Indian Ocean for making a direct run to the west coast of India from Africa and Arabia is credited to Hippalos, a Greek sea-captain of the first century A.D.

Excepting the Viking voyages to Greenland and to North America, no further recorded progress in deep-sea travel was made till that far-sighted Portuguese prince, Henry the Navigator—in whose veins it is our pride that English blood mingled with that of his fatherland—founded his famous School of Navigation. Under this impetus, a succession of Portuguese sea-captains mapped the oceanic coasts of Africa and discovered the sea route to India, to the Malay Peninsula, and through Indonesia to China and Japan. It is, however, to Columbus that the outstanding merit belongs of being the first to abandon the slow, coastwise system in favour of deep-sea routes, with implicit trust in compass and the stars as guides.

The final blow to the timid methods of the old sea-school was given by the voyage of Magellan across



FIG. 1.

SINGLE OUTRIGGER CANOE USED IN MAYOTTE.

Comparison indicates that this form has been derived from the more primitive double outrigger found in Madagascar, to which Mayotte is the nearest island.



the Pacific, an ocean wider and more dangerous to navigation than is the Atlantic; thenceforward mariners of the principal European nations vied with each other in marking out sea-trails over the seven seas, and in locating the myriad islands sprinkled thick as the stars in the sky in the central and western sections of the newly-discovered Pacific Ocean.

But the discovery of the islands was of minor importance in comparison with the fact which became recognized at an early date that a great number of these, irrespective of distance apart, were inhabited by people of one race, of high intelligence, fine physique and speaking dialects of the same tongue. This people, the Polynesians, were linked on in turn to the Mongoloid peoples of the Malay Archipelago, otherwise Indonesia, by fundamental relationship in language and certain features of material culture—



FIG. 2.  
DOUBLE OUTRIGGER IN THE COMORO ISLANDS.

A typical survival of the double outrigger, formerly predominant in Madagascar, now ousted almost entirely by the single type

particularly in the common use of canoes fitted with outriggers. Finally, we find a large section of the population of Madagascar to be closely related physically to the people of Indonesia, and the Malagasy language of the entire country to belong to the same linguistic family as those spoken in Indonesia and in Polynesia.

How did these far-flung fragments of the main stocks come to be scattered? By what means did they accomplish such lengthy migrations? Madagascar is separated by an ocean space of some 4,000 miles from Sumatra and Java, the nearest of the Indonesian islands; there have been no stepping stones between, for the people of Ceylon and the Maldives have no near kinship either with Indonesia or Madagascar, whether we look to their racial origin or to their languages; all other islands between, the Seychelles, Mauritius and Rodriguez, were found uninhabited and without trace of former population when discovered by Europeans.



FIG. 3.

A PSEUDO-DOUBLE PASSENGER OUTRIGGER, MADAGASCAR.  
With twin masts and a vestigial outrigger on one side, this is a transitional form between the double and the single type. A broken canoe is seen in front.

Similarly in the case of Polynesia, there are inhabited islands and island groups separated by vast sea-spaces from those whence came the original colonists. The Hawaiian Islands lie 2,500 miles north of Tahiti, New Zealand is 1,600 miles from Rarotonga and 2,500 miles from Tahiti, while Easter Island, furthest east of all, is over 2,200 miles from Rapa, the nearer of the two islands whence tradition says it was peopled. The whole assemblage of Polynesian islands covers a vast area, measuring some 4,000 miles by 4,500, all inhabited by one race speaking comparatively unimportant variations of the same language.

A partial solution of the problems involved is to be had by study of the canoe forms now and formerly in use in the various localities; in the case of Polynesia the inquiry is aided most effectively by traditional accounts of several of the more important inter-island migrations.

When Madagascar became known to Europeans early in the sixteenth century, the coastal tribes were wholly without any maritime commerce of their own. Their only vessels were sewn-plank surf boats, akin to the *masula* boat of Madras, and outrigger canoes of small size. Oversea trade did, however, exist, but was in the hands exclusively of Arab and Indian traders and shipowners, the ports on the north and western coasts being frequented by Arab baggalas (the craft usually called "dhow") from Arabia and the Arab settlements on the east coast of Africa, and by Indian kotias from Kutch and Gujarat. Neither of these people has racial kinship with either of the two sections of the population of Madagascar, the Mongoloid one akin to the people of Indonesia, or the Negroid, with its nearest relatives in Melanesia.

Ignoring the latter for the present, by what means did the Mongoloids reach the island from the motherland of Indonesia? It is obvious that they came



FIG. 4.  
ZANZIBAR CANOE, SHOWING OUTRIGGER CONNEXION.  
This method (illustrated in detail in Fig. 5) is common to all the native outrigger canoes of Madagascar, the Comoro Islands, and East Africa.

by sea; the land route along the south of Asia is barred, as there is no trace of Indonesian settlement at any intermediate point. Tradition is silent in Malaysia as well as in Madagascar concerning any old-time connexion, and we are driven to the conclusion that the forefathers of the Malagasy were formerly expert sailors, possessed of far larger and better equipped sea-craft than any now existing; that after finding in Madagascar a land big enough and fair enough to meet their requirements, they lacked thenceforward any incentive to continue the hard and dangerous career of sea-wanderers when political conditions caused a cessation in sea traffic with the motherland. Parallel circumstances changed the Polynesians of New Zealand from adventurous vikings to home-staying agriculturists.

Throughout Indonesia the double-outrigger canoe, characterized by a float boomed out on each side, is found common everywhere save in Sumatra, Borneo, and parts of Java, where it has been supplanted within historic times by other types; in Madagascar, the outrigger canoe is equally common along the whole extent of the west coast, the east coast being so surf-beaten and dangerous as to be unattractive to a seafaring population. To-day the Madagascar outrigger vessels are all undecked craft, the hull usually formed of a dugout canoe, with the sides raised by means of a broad plank sewn to the upper edge or bolted to timbers. They are employed entirely within the quiet waters of the great bays and estuaries for fishing and for passenger and light cargo traffic. None is used for voyages outside of the coastal waters of the island.

When the island was first visited, an old record states that double canoes were as common as single ones. To-day the latter have almost entirely ousted the double form, but a majority of the single type exhibit their derivation from the double form by the

presence of a thin pole, a vestigial float, attached longitudinally between the projecting ends of the booms on the offside (Fig 3). The conclusion that the Malagasy outrigger boats were originally double outriggers receives definite confirmation when we examine the corresponding craft in the Comoro Islands, a small group lying between Madagascar and Africa. There the single form (Fig. 1) is predominant in Mayotte, the island nearest Madagascar; at Anjuan, further west, the double one is more common than the single, whilst on the African coast, where it has been introduced from the Comoros and Madagascar, all the fishing canoes are furnished with the double outrigger, and are of simpler and more primitive type (Figs. 2 and 4).

That they have all had a common origin is evident when we examine the method of connecting the float or floats with the ends of the booms which project on one or both sides. Amongst the peoples using the outrigger design, this is the point of greatest diversity and importance; better than any other detail, it furnishes evidence of origin and relationships. The canoes of Madagascar, the Comoro Islands, and East Africa (Fig. 4) all agree in possessing a most peculiar and characteristic type of connexion, the essential feature of this being the insertion of the end of each boom *through* a hole in the shaft of a connecting bar, which may be either short and peg-like or elongated into a broad stanchion-like form (Fig. 5).

In Indonesia we find a perplexing variety of methods employed to connect the booms with the floats. One very common type seen commonly in Lombok and Halmahera is where a recurved rod is employed very like the elongated stanchion type of East Africa, but with the boom lashed to its upper end instead of perforating it. Still more closely related in form is a type seen in certain degenerate fishing canoes on the north coast of middle Java. In these, which are single outriggers, a single boom only is employed,

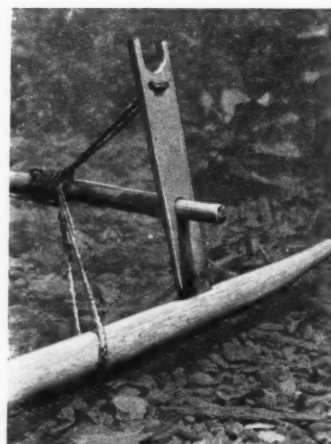


FIG. 5.  
BOOM AND FLOAT CONNEXION.  
The essential feature of this type of connexion is the insertion of the boom *through* a hole in the bar connecting with the float.



the connexion being by means of a short board, inserted below into the upper surface of the bamboo float, and with the bamboo boom passed through a hole in the upper end. Nowhere else in Indonesia is this form of connexion employed, and there is every reason to consider it as a degenerate survival of the method employed in the outrigger vessels of one of the waves of Indonesian emigration that surged upon the coast of Madagascar many centuries ago.

In general the outrigger craft of Indonesia at the present time are too small and frail for the journey of 4,000 miles from Java to Madagascar, though the large cargo outriggers to be seen any day in the old Javanese seaport of Grisee are conceivably equal to the voyage (Fig. 7). Even these are small in size compared with those the Javanese possessed a thousand years



FIG. 7.

## LARGE MODERN OUTRIGGER AT GRISEE, JAVA.

While such vessels might conceivably sail 4,000 miles to Madagascar, the voyage from Java was probably undertaken in much larger boats during the ocean migrations of two thousand years ago.

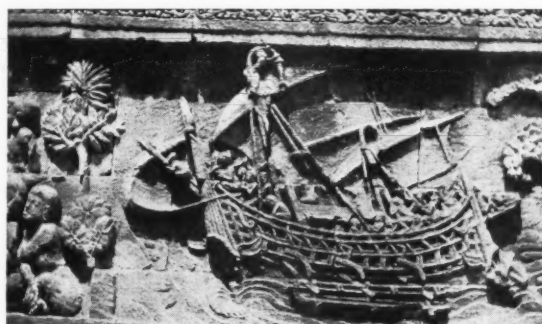


FIG. 6.

## AN EIGHTH CENTURY JAVANESE VESSEL.

A large sea-going double outrigger is pictured in this sculpture, which is part of a panel in the great Buddhist shrine at Boro Budur.

ago. What they were then the sculptured panels of the great Buddhist shrine of Boro Budur mutely testify (Fig. 6). On them are to be seen graven in high relief the representations of several large, two-masted, outrigger ships, probably as large as the ships in which Columbus and the Pinzons crossed the Atlantic. In one panel a vessel is shown with a massive compound float made up of several logs lashed together and attached by curved intermediaries, resembling the Lombok type, to squared booms obviously of exceptional strength. In such a large and strongly built vessel carrying a large sail area a voyage across the Indian Ocean would present no special difficulty, particularly on the southern side of the equator. But, so far as we know, direct communication between the motherland and her African colonies had ceased several centuries before Boro Budur was built (*circa* 8th century); unlike modern Javanese, the Malagasy language contains few, if any, words of Sanscrit origin, excepting those introduced at a comparatively recent date by Hindu traders, a proof that the last

wave of colonization reached the island before or concurrent with the conversion of Sumatra and Java to Buddhism and Brahmanism in the early centuries of our era.

There was far more movement in the Indo-Pacific area, 1,000 to 3,000 years ago, than is generally recognized. Old kingdoms of great magnificence and extent undoubtedly existed whereof the names even have been forgotten, though occasionally a ghostly shadow may be recovered by patient research; an example of this is that notable discovery by Gabriel Ferrand of the existence in Sumatra, at a date somewhat prior to the building of Boro Budur, of a powerful kingdom with its capital at the modern Palembang, which exchanged embassies with China and held power even on the mainland of Asia. In its homeland the name and memory of this kingdom had vanished as though it had never been, and only from the historical records of China has it been possible to reconstruct a slight outline of some incidents in its story.

With the knowledge that the Javanese possessed large sea-going outrigger vessels as late as the eighth century, when Indian influence and religion had been powerful for several centuries in the land, and that the Malagasy language contains few Sanscrit words, these, together with other considerations, justify us in placing the latest migration of Indonesians to Madagascar at a date about the beginning of our era. It is not unlikely that this final movement coincided with the settlement in Java and Sumatra of large numbers of warlike Indians, and with the efforts successfully made by these adventurous bands to acquire ruling power and to impose their religion upon the mass of the inhabitants. If the last wave of immigrants into Madagascar fled there to escape a foreign yoke, we can understand the reason for a

subsequent severance of all ties binding them to the motherland. As a consequence of the loss of free and frequent intercourse with their kinsmen across the sea, and the ease of life in a sparsely inhabited and fertile country, culture would stagnate and the people would quickly lose that spirit of adventure which they must have possessed to induce them to brave the hazards of a voyage across the Indian Ocean.

I have been careful to restrict these references to the last influx of colonists, that which probably brought the ancestors of the Hovas to the island. Authorities agree generally that there must have been several preceding surges of immigration; if so, this indicates a long-standing knowledge of this particular sea route. There are, indeed, several indications; among others, the ancient reference unearthed by Ferrand recording a visit to Aden of trading vessels believed to have come from Madagascar, and the prevalence of an Indonesian type of outrigger over the greater extent of the East African coast—from Port Amelia in Mozambique, continuously northwards to Lamu, near the border of Italian Somaliland. It is not unlikely that Indonesian trading ships, either from Sumatra or Java, or from their colonies on the coast of Madagascar, had trading posts and even settlements at convenient ports on the African littoral.

#### Vikings of the Pacific.

The greater problem remains: By what means did the negroid tribes reach the island? There can be no real doubt that they are derived from the Oceanic Negro stock that peopled Indonesia prior to the Mongoloid influx, and which in its undiluted state persists in New Guinea as the Papuans and in a mixed condition throughout Melanesia. Their physical affinities are distinctly Melanesian and their language has scarcely any relationship to any in Africa—what little there is, being due to the influence of slaves imported from the adjacent mainland. The African negro has no sea instinct; he has never built any seagoing craft; in these characteristics he agrees with the Papuan negro of pure stock. It is otherwise with the Melanesian; his negro blood has been vivified by admixture with that of a more adventurous race, and though he has been ranked lower in the latter quality than the Polynesian, he has been a marvellous canoe-builder and was able to give lessons in this even to the latter. No finer pre-European vessel has ever been built in the Pacific than the old-time Fijian double-canoe. The Tongans, vikings of the Pacific, are known to have discarded their own type of double-canoe for that of Fiji. Samoa did the same. Even to-day the Melanesian fishermen of

the northern coast of Papua build the finest type of single outrigger now existing; on it, in a neat cradle, they carry a dugout canoe as a passenger steamer carries lifeboats. A wide platform, laid upon the booms, gives accommodation for a considerable number of persons, and the outrigger is so stoutly built that it can weather heavy seas with safety.

#### Early Colonies.

There are indications in many islands of the Pacific, even in distant New Zealand and the Paumotu, of an admixture of Melanesian blood. We know that the Polynesian race has degenerated out of all likeness to its past glory; at one period its energy was enormous—no sooner had it waxed numerous in one island, than exploring expeditions were sent out; following them, swarms of colonists hived off to whatever new lands were discovered. To-day, however, they show no more energy than do the Melanesians, usually even less.

If the one race has passed from a virile manhood to lethargic senility, is it not reasonable to suppose, in face of Melanesian blood in Madagascar and in far-sundered isles in the Pacific, that they too had their noontide of seafaring energy, that in their outrigger vessels they also founded colonies in Madagascar at a period far antedating the migrations thereto of Mongoloid Indonesians? It is probable that it was the pressure of an invading race on the homelands of the Melanesians that caused the latter to seek refuge across the sea. Aided by the trade-winds and the westward-moving equatorial current, a journey from Java to Madagascar in the fine outrigger vessels of the Melanesian fishermen of Wakde in Northern Papua, if properly provisioned, would be a far easier journey than that performed by Bligh from the coast of Tonga to Timor, or that of the *Trevassa's* boats from off Australia to Mauritius and Rodriguez. Whether the first journey was made under the impulse of the adventurous spirit, as were many performed by Polynesians in olden days, or was an unpremeditated drift voyage, it is certain that these people were in fit condition to return and tell the tale, and thereby initiate recurring migration or rather colonization. And the earliest of these movements must have consisted of people of Melanesian race.

The ocean voyages of the Melanesians have unfortunately been given little attention compared with those of the Polynesians owing to their greater remoteness from our own time; did we know as much about them as of the latter, we should probably find them equally wonderful and daring, and possibly as widely spread.

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## The Cuna Indians of Panama.

By Erland Nordenskiöld.

*The Götheborg Museum, Sweden.*

*In our November issue Professor Nordenskiöld gave an account of the first discoveries of the Swedish expedition which has just returned from Central America. During the concluding travels a visit was paid to the president of a remarkable Indian republic.*

IN a previous article I have given some account of the Chocó Indians, and here I propose to touch upon the Cuna, or Tule, Indians. This notable tribe, among whom the Scots founded their famous colony in 1699, is to this day to a large extent quite independent. In the old piratical days the Cunas befriended the pirates and assisted them against the Spaniards. Their sympathies have always greatly leaned towards everything British, and an exceedingly valuable account of the Cunas of the seventeenth century has been written by the Englishman, Wafer.

We had anchored our motor-boat "Olga" off Ustupu, or Portogandi, one of the largest villages of Tule, the Cuna republic on the Atlantic side of the Isthmus of Panama. It is a small island lying a mile or so from the mainland, and is built all over with huts, for in these parts the Indians live on small islands off the coast, where they are clear of mosquitoes and, incidentally, of malaria also. All their cultivations, with the exception of their cocoa palms, are situated on the mainland whence fresh water has to be fetched daily, there being none on the small coral islands off the coast. In the mornings the women may be seen crossing over to the mainland in their canoes with a multitude of calabashes for bringing back water and the men also go over to look after their cultivations and to hunt game. This mode of living is of comparatively recent origin, as only a hundred years ago all the Cunas were living on the mainland.

In a very few moments our boat was invaded by swarms of Indians who had come out to us in their

canoes, but only men and boys, and no women, had ventured out. Their canoes, made to carry sail, are dug-outs with both ends peaked to a fair elevation, and seem to possess fine sea-going properties. The

Cunas are excellent seamen, and many of them have signed on in ships at Colon and sailed far and wide. They have mostly been to England and North America, and there are many who speak English fairly well. We came across two Cunas who had been to Sweden, and were told of one man living in the village of Ailigandi who could speak Swedish. He, like so many other Cunas, had taken an European name and called himself Lyon. Fine-sounding names are popular, one headman even having adopted the name of Napoleon Bonaparte, though otherwise being a person of no particular importance. Other names are Martin Luther and Henry Clay, but generally speaking the Indians have genuine native names.

Among our visitors on board were the chief's sons, and we received invitation to call on him ashore. We were somewhat apprehensive as to what our reception there would be like, for since February, 1924, when the Cunas revolted and killed the policemen that the Panama Government had stationed in their villages, no foreign vessel had put in at Ustupu, and we knew that the Cunas were not to be trifled with. A few years ago a party of rubber-seekers on the mainland had entered Cuna territory. They were given notice to clear out within twenty-four hours, but did not take this warning seriously, consequently the chief ordered that they should be killed, and his command was



INDIAN SAILING-CANOES.

The art of sailing is a recent accomplishment learnt from the white man, but the Cunas are nevertheless excellent seamen. They live on islands and use canoes to reach the mainland.



CUNA WOMEN AND CHILDREN.

Not only are elaborately woven dresses and beads worn, but the women and girls wear a nose ring of gold, even before they have learnt to walk.

duly carried out. Thus there is at the present time not a single negro or white man living in the Tule Republic, although this branch of the Cunas are not only formally but also actually under the authority of Panama. By the word "white" in this connexion I am referring to persons of European descent, as there are so-called "white Indians," *i.e.*, albinos. It is gratifying to notice how the Indian stock here is untainted by admixture with negro blood, a point on which the Cunas have always been very strict. At the massacre of the black policemen the Cunas also killed the children the negroes had by Indian women, and such of their own women who were pregnant to negroes were compelled to procure abortion.

A small motor-boat was got ready to take us to the landing-stage. At this spot, as on most of the huts, the flag of the Tule republic is flown, which has an orange-coloured middle portion showing a blue swastika, and blood-red borders. On one solitary house the flag of Panama had been hoisted, this representing a minor section among the Indians who desire reconciliation with the Republic of Panama. The sea teemed with life and movement, canoes approaching from the mainland loaded with water and produce from the cultivations. The country struck us as out-and-out Indian. The harbour was thronged with boats, on many of which the sails were spread to dry. Boat-sailing is a recent accomplishment of the Indians, who learnt it from the whites. As we stepped ashore we were met by a crowd of

men, women and children, the latter, however, being somewhat shy. In this crowd they constitute the picturesque element, with their quaint dresses sewn in embroidered pattern and fancifully ornamented, their nose rings of gold, and their enormous golden ear-pendants. We saw about us as much gold as if we had arrived among the Indians at the time of the Conquest. The men, on the other hand, wear shirts, trousers, and a hat, and when ponderous golden ear-drops are worn in conjunction with this European apparel, the effect is somewhat bizarre.

In the village the houses are built very closely together, two houses sometimes having one wall in common. They are of rectangular shape, built of logs and roofed with palm leaves. The floors consist only of earth stamped down, and hammocks are used for sleeping. The streets are narrow and most irregular. Here and there is a small plantation in which flowers are grown; in some of these plots even roses may be seen. The village is clean and well-kept, the satisfactory hygienic conditions being in part due to the presence of water-closets that are built overhanging the water. The Cunas are of great personal cleanliness, as they always bathe in fresh water, while the children habitually play on the sea-shore.



A VILLAGE STREET SCENE.

The houses, built of logs thatched with palms, are placed closely together on narrow irregular streets, but the Cuna villages are clean and well-kept.



The children were keenly interested in us, the more so since I distributed a few trifling presents among them. The small girls looked very comical, wearing golden rings in their noses even before they had learnt to walk, and they were dressed in exactly the same way as the grown-up women. Our objective was the assembly hall, a building of much the same kind as the rest. At one end there were terraced seats surrounding an open space in which were a few hammocks and chairs. At our entry we found the place packed with people, the chiefs and elders occupying the seats in front, behind them being the rest of the men and, farthest back, the women and children. We were asked to sit down, though the chair assigned to the head chief was still empty. Like royalty nearer home he prefers to defer his appearance until the gathering is complete! We were fortunate indeed, for we had happened to arrive while an election for chief was in progress. Napoleon Bonaparte of Isla de Pinos was there, as also the chief of Carti, a village of five thousand Indians, and presently there arrived the head chief of Tulehuala, *i.e.*, of the Cunas of the interior of the mainland, whose district no white man has ever visited.

After a brief spell of waiting there entered a stout little gentleman dressed like the rest of the men, and, like them, bare-footed. This was El Néle, president of the Republic of Tule, and a great medicine man withal. We saluted him, and he gave us a friendly greeting in return. I offered him some cigars and presented him with an alarm clock with luminous figures. Through the interpreter I explained to the chief why we had come and what we were after. I suspect that he understood my Spanish quite well, but nevertheless everything said had to be translated into Tule or Cuna. Besides, he knew who I was, for that had been read out to him by his secretary, Ruben Perez Kantule, from a Panama newspaper. Ruben subsequently proved of inestimable service to us. He had been to school in Panama, but in the revolution of 1924 he had joined the revolting Indians, and hated the Panameños from the bottom of his heart. Now he was one of El Néle's secretaries, and

was of very great use, as he could write Spanish almost perfectly, and was intimately acquainted with conditions in the town of Panama. Ruben told El Néle that we collected things to write books about, and to put in a museum, and he then explained the nature of a museum.

El Néle was a trifle suspicious to begin with, but gradually he thawed. No doubt this was partly accounted for by the fact that, like his good countrymen, he had no objection to doing a little financial exploitation of us, everyone finding he could do with our trading-wares and dollars. I broached the question of obtaining permission to take

photographs. Only those Cunas who have been about the world are opposed to photographic operations. "We do not want to see our women on picture cards," they say. El Néle gave us leave to photograph down at the harbour, and not in the village itself, but later on we were free to snapshot anywhere—if we paid in tobacco!

People in high places generally liking to be flattered, and I told him, through the interpreter, that I had heard great reports of his wisdom, and asked him if he would not let me also profit by it. He promised to receive me in a second audience next morning at eight o'clock, with

the added injunction that I must be punctual. The alarm clock I had given him had already been hung up on a pole opposite El Néle's seat in the assembly hall.

After that we bid adieu for the time being, and returned aboard the "Olga," which was beleaguered far into the night by Indians eager to carry on a bartering trade with us, or wishing to sell us bows and arrows, women's dresses, and other things. Although my wife was present, the women still kept away. The next morning I presented myself punctually at the appointed time at El Néle's, and then with the greatest willingness he told me many things about the Cuna Indians' beliefs in God, the nether world, and so forth. I also succeeded in collecting a great deal of information about the Cunans' conceptions of illness, much of which the Indians have recorded by means of their exceedingly remarkable picture-writings.



THE CHIEF OF THE CUNA INDIANS.

The Cuna Republic is governed by election among the Indian chiefs, and the head chief is here seen. The men wear semi-European clothes but go about bare-footed.

## Researches on the Economic Factor in Birds.

By C. J. Patten, M.A., M.D., Sc.D.

*Professor of Anatomy in Sheffield University.*

*While bird protection measures have lately been given considerable public attention, the ruthless destruction of many common species proceeds apace. Yet some of these are most helpful to farmers, fruit growers, and others, who do not always trouble to discover their value.*

AN old and useful adage warns us not to kill the "goose" which lays the "golden egg." This goose stands sponsor for most species of our wild birds which, in a state of nature and under ordinary well-balanced conditions, lay the golden egg. In other words, in the light of the economic factor, the existence of the bird creation benefits man. Furthermore, not man individually but nations at large reap these benefits.

But at the outset it may be asked—What about feathered vermin? The answer is not far to seek. The term "vermin" as applied to birds has no analogy to vermin in its strict sense. Lice, bugs, fleas, tape-worms, mosquitoes, horse-flies, and many other pests which attack man individually, whenever they can get a foothold, are vermin in the absolute sense. Here it is the duty of the community to aid in checking vigorously the onroads of these pests. It matters not whether sanitary officers, medical inspectors of schools, or any other sect are told off to carry out this task, the principle holds good that all of us are deeply concerned in favour of destroying, nay more, of stamping out these obnoxious pests whenever possible. Hawks, owls, crows, and magpies, are not by any means vermin in the absolute sense. These birds have never deserved such a degraded misnomer. They are only vermin in the eyes of the game-keeper who, in the interests of his master, promptly puts an end to their lives if they dare enter his game-preserves. In many instances these very predacious birds are frequently mere wanderers, which, if unmolested, would pass in at one end of the forbidden ground and out at the other without further ado, especially

when affecting a migratory movement. Again, apart from game, other creatures in abundance inhabit many preserves. Such are often the selected quarry of the "vermin." It is obvious then that here the use of the term "vermin" is on the whole misleading. True, all of us may not be equally concerned with the sad destiny which awaits hosts of birds of prey.

There are, however, great numbers of nature-lovers who with deep regret learn of the wholesale diminution in numbers of any kind of bird through its being specially ear-marked for destruction. Apart from the question regarding the decided economic value of birds of prey (a point which I shall deal with presently), it always seems

unfair to the zealous ornithologist that on account of game preservation having such an exclusive monopoly in many districts, hawks and owls are almost wiped out; consequently their intensely interesting habits (especially their magnificent wing-movements), cannot possibly be studied. One likes to think of a game-keeper—and we know that nowadays there are many—as a man of discrimination, who, by consulting books, and by taking an intelligent interest in the feathered world, can make up his mind to spare that splendid buzzard, which he has just disturbed in the act of devouring a rabbit, captured from among hundreds of grouse which stock the moorland scene! It is, indeed, painful to think of a game-keeper or anyone else allowing himself, through sheer carelessness and ignorance, to become a wholesale exterminator of birds of prey over a large tract of moorland or covert. What does the farmer say when his corn-stocks are studded with flocks of chaffinches, greenfinches, and sparrows? No doubt he brands the ravagers of his crops as "vermin." But then,



KESTREL WITH CAPTURED MOUSE.

This charming little falcon deserves our protection, as it keeps the ravages wrought by small rodents and pestilential insects largely in check.\*

\* As in the previous articles in this series, the photographs are taken from life by the author. The illustration on page 17 is of a specimen which he collected and mounted.





BIRDS OF PREY IN THE ORIENT.

It is fascinating to watch the superb aerial movements of birds of prey at ports in the East. Kites predominate, but buzzards and eagles also help to swell the numbers. The birds, in search of offal, hover and glide with buoyant grace alongside the ships, pieces of meat cast overboard being often snatched up before reaching the water. The photograph was taken at Aden from the deck of a steamer.

why are the birds not only so numerous but also so persistent in their destructive work? Because man—and we must include the farmer himself—has ruthlessly destroyed not only the “goose” but also its “golden eggs” whenever possible, here perforce the sparrow-hawk! “A sparrow-hawk left to himself even by scaring the sparrows from ripe grain will save the wages of at least ten boys,” says Mr. E. Newman, F.Z.S. Let me give an appropriate example which came under my own personal notice.

A field of ripe wheat, flanked by trees and bushes, afforded a sparrow-hawk a favourable opportunity of stealing on his quarry unawares. A finch from amidst hundreds in the field was easily surprised and snatched away, so that here the hawk found a happy hunting-ground. So persistent were the small birds in their greed to devour the grain that the presence of the hawk three or four times a day did not drive them from the neighbourhood. But after each capture was made the flocks betook themselves to the road-side, gardens, and sea-front, where they remained for some two hours and gathered whatever food-stuffs were obtainable. They had not returned to devastate the wheat e’er long before another of their companions was borne away, and again the grain was deserted for a few hours. The hawk partook of about four meals a day at quite regular intervals. We will say he had his “breakfast, dinner, tea, and supper,” and while he only reduced the numbers in the flocks (of several hundreds) by four birds a day, his visits were such a splendid deterrent that he saved

the owner of the crops many sacks of wheat in the season. Nor has the story come to an end. In the fading twilight of a beautiful September evening I descried a white or barn-owl quartering the ground of the same field with the regularity of a pointer dog. He also frequently re-visited this hunting-spot, and on more than one occasion I saw him glide down on noiseless wing and pick up his mouse. As Tennant says:

“Now may we follow on his curving flight,  
The white owl mousing in the failing light.”—

How many mice were secured during the night by him (and there is no reason to suppose that another owl did not participate in the same hunting-grounds, for they often appear in the plural number) after I had retired to rest I cannot say, but there is no doubt that the owner of the crops reaped an inestimable benefit by the presence of these birds of prey.

I have still a word or two more to add to my story. Adjacent to the corn-field was rough pasture-land, studded here and there with furze bushes, thistles, and rag-weed. Parties of twittering goldfinches, exquisitely beautiful birds, perched on the thistles, were regaling themselves, the seeds of which we know are their favourite food. They little heeded the kestrel hawk who above them on fluttering pinions appeared motionless as though suspended by an invisible thread. When, however, the charming little falcon dropped like a stone to earth, and picked up his grasshopper or beetle, rose again, poised, and repeated his swoop to earth, the sprightly goldfinches, having by this time had a hearty meal, grew mischievous and

took it into their heads to mob the bird of prey. As Keats says, they

" Sip and twitter and their feathers sleek;  
Then off at once, as in a wanton freak."

In his endeavours to evade his pursuers the kestrel attracted the attention of some of the other finches, who, relinquishing for the time being their ravages on the corn, joined in the game. He then perched on a telegraph-wire, where all the little birds, numbering about forty, arranged themselves in line on either side of him. Now for a brief space of time we have a pretty view of hawk and finches fraternizing harmoniously. Presently, however, the kestrel took wing, and I finish my story by telling you that his intrepid lesser companions followed him for a short distance in order to see him safely off the premises! The kestrel—probably on the whole the most numerous, and certainly the most widely distributed of our British hawks—cannot be mistaken. His reddish-brown back and wings in the first place distinguish him from the other British hawks, whose upper plumage is dark slaty-blue or brownish-black according to age, sex, and plumage. Secondly, he is the only one of our hawks who suspends himself in the air when searching for his quarry, his wings all the while vibrating so rapidly as to appear motionless. For this reason he has been called the "wind-hover." He should never be shot, because the percentage of small birds which he kills is exceedingly low and as far as game-birds are concerned he can present practically a clean sheet. As far back as 1906, I published a series of articles in the *Irish School Monthly* dealing with "the economic uses of birds," in which I stated: "I have examined the gizzards of over two hundred kestrels, and in only twelve of these have I found the remains of small birds, and in five of the twelve cases, the kestrels were shot in the breeding-season when the extra task of catering for their young was thrown upon them. As I write I am watching my pet kestrel in the garden with the sparrows hopping round him."

But it is to the agriculturist that he is the real benefactor. For while he refrains from joining hands with the sparrow-hawk in saving the crops from the ravages of grain-eating birds, he checks the ravages

wrought by mice, voles, young rats, beetles, and other deleterious insects. At sundown he retires to rest and his place is taken by the barn-owl, the tawny owl, the long-eared owl, and the short-eared owl, when the raid on mice is renewed, and a heavy toll of larger rats, some quite full-grown, is enacted. Is it any wonder then that Lord Lilford once said that the man who shot an owl is only fit to be in a lunatic asylum!

The carrion crow (or perhaps his congener the hooded crow) appears on the grouse-moor in the breeding-season. Must this pirate go under the moment he crosses the threshold? Lower your gun, wait a minute! Listen! a far-reaching melodious

whistle is being wafted on the breeze and is growing more distinct, and look! the crow has already turned tail, but not before the valiant curlew is abreast, screaming, and mobbing him remorselessly. The guilty and suspicious crow, fearful of being observed, fearful of other and more deadly enemies being attracted to the scene, beats as hasty an escape as he can, and entering cover rejoices that his escapade has not terminated in disaster.

Curlews and lapwings breed on the moors. They will fearlessly attack and drive off the raven, crow, or hawk, and in this way fortuitously shield the grouse and their eggs or chicks. Crows as a race are almost omnivorous, and their depredations on game are, on the whole, over-rated. Keep them in check should they get the upper hand which is very unlikely. But for the sake of the student of ornithology pray do not exterminate them from a district. In the East, birds of prey and crows are not interfered with, and rightly so, for they are most useful scavengers. I was, indeed, infatuated with the superb aerial movements of large numbers of vultures, eagles, buzzards, kites, and crows, which I witnessed at Aden, Bombay, Colombo, and other Eastern ports. The crows accept food in many cases from the hand, and the hawks swoop exceedingly close by and seize in the air pieces of meat thrown to them. Many years ago the larger birds of prey were a dominant feature of bird-life in the British Isles. Now most of them are gone. The golden eagle under rigid protection survives in limited numbers in the



THE PIED WAGTAIL.

Wagtails, as a race, are exceedingly active and evince an insatiable appetite whenever flies buzz around. The insects are snapped up and demolished with amazing rapidity.

remote Scottish Highlands. South Wales alone offers a retreat for a few surviving kites, a bird which formerly was plentiful about London city and its river estuary. As we watch these splendid birds in all their glory in the East, it grieves us all the more to think that they have now almost vanished from our isles.

Let us for a moment turn our attention to a few of our familiar garden-birds which, sharing our taste, consider fruit very palatable. Like ourselves, they do not by any means subsist wholly upon fruit, indeed, their depredations are frequently exaggerated.

There is some excuse for the professional fruit-growers—men whose sole livelihood depends upon the success of their crops—to take steps from time to time to thin out the numbers of blackbirds, thrushes, and starlings, when these fruit marauders get the upper hand, but here again purely destructive measures when adopted may not always succeed. It has been shown in some cases that after a wholesale slaughter, say of a thousand blackbirds, the birds soon become more numerous than ever, which sounds as though the old saying were true of blackbirds as of flies that if you kill one, twenty come

to the funeral. The blackbird is an abundant bird, and its numbers are augmented by thousands of immigrants from the continent, so that acres of ripe, juicy fruit will soon attract fresh invasions in lieu of the slain. It has been suggested that a scaring machine might prove more effectual than the gun. It is obvious that by adopting this measure loss of life would be mitigated, and in that way a larger population of blackbirds and other fruit-loving birds would be spared to carry out their useful work during the remainder and greater part of the year, when they destroy countless numbers of noxious grubs and other agricultural and garden-pests.

In our private gardens, especially when they are well stocked with fruit trees, there is little to be gained and, for bird lovers, much to be lost in shooting a pair or two of bullfinches the moment these lovely creatures appear on the scene to pay us a very short annual visit. It is perfectly true that our fruit buds are actively raided, but there are other

ways of checking our delightful visitors without taking their lives. Stay in your garden for a while, approach the birds closely, and they will soon pass on to another tree, follow them and they will select another tree. Keep moving and they will flit from tree to tree and nicely prune the quota of expectant fruit which later on, when half-grown, demand thinning out by the gardener. There are always more apple-buds in an orchard than can ripen. Look at the quantities of unripe fruit which fall, when too thick, if a breeze rises. Lastly, when the fruit has ripened look at the

plethora of wasted apples lying at the foot of the tree. Surely many bird-lovers would give away scores of apples for the sake of the honeymoon spring visit of the beautiful affectionate bullfinches. As a benefactor to man, the bullfinch destroys a very appreciable amount of insects and their larva, on which it feeds its newly-hatched offspring. In autumn and winter, the seeds of dock, chickweed, groundsel, and dandelion, are consumed in great quantities.

The economic value of purely insectivorous birds is enormous. Statistics are often distasteful; here one or two will prove interesting:



THE SPOTTED FLYCATCHER.

This bird is an abundant and widely-distributed summer-resident in our isles. Roughly speaking, a pair of flycatchers will destroy 2,500 flies in a week, and probably more.

a great titmouse brought food to its young 384 times in the day, 90 per cent. of the food consisting of harmful grubs or caterpillars, so that when rearing the young it would be responsible for the destruction of 8,000 to 9,000 insects, chiefly caterpillars. My own records, for several of our common species, show that young birds are fed on an average every three minutes. Roughly speaking a pair of fly-catchers will destroy 2,500 flies a week, and probably more. Wagtails, pipits, warblers, and hosts of others, make the same clearance. The amount of food in the aggregate which a bird will consume in the day is prodigious, amounting to one-sixth of its own weight. Young birds eat food amounting to their own weight in twenty-four hours! A young robin can demolish fourteen feet of worm in twelve hours, and more if it be brought to it! In conclusion let me say that it cannot be too strongly urged that insectivorous birds are largely instrumental in maintaining the food-production of our isles.

## The Temple of the Warriors.

American Excavations in Yucatan.

*The following report of work which the Carnegie Institution is now undertaking in Yucatan describes the discoveries of the season just brought to a close. Among the plans foreshadowed for 1928 is the repair of an astronomical observatory, the oldest structure of its kind in Central America.*

THREE working seasons ago the Temple of the Warriors, Chichen Itzá, Yucatan, to the eye of the casual observer, seemed nothing more than a tree-covered mound of debris rising fifty feet above a heavily-wooded plain.

To-day, as a result of the work of the archaeologists of the Carnegie Institution of Washington, this sanctuary of Kukulcan, the patron deity of Chichen Itzá, gives visible proof of ancient magnificence. It is now clear that the Temple of the Warriors is by far the most elaborately decorated building at Chichen Itzá, once the capital of the New Maya empire, which contained a great number of imposing structures. It is also evident that it is one of the most beautiful examples of Maya architecture extant.

For centuries the splendid limestone structures of the greatest of America's aboriginal races have been assailed by nature's relentless forces. Wind and rain have beaten upon them, roots of giant trees have riven roofs and walls. As a result most of the formerly magnificent buildings have been reduced to huge piles of fallen masonry. The task of the archaeologist, attempting to repair these structures, consists of clearing these mounds of trees and underbrush, digging out and identifying the fallen structural elements, and returning them to their original positions. This replacement work on the Temple of the Warriors has now gone about as far as it is possible to carry it with the certainty that it faithfully conforms to the structure as it originally stood.

The Temple proper rests upon a pyramidal foundation 37 feet high and 136 feet square at the base. The hearting of the pyramid is of masonry and is faced with cut or dressed stone, the pyramid foundation rising in four retreating terraces. Each

of the vertical parts of these terraces, except the uppermost part, carries a richly sculptured frieze consisting of eagles, jaguars, warriors, and an unknown quadruped which the Institution's archaeologists,

for want of a better name, have called "the wooly."

The design of the friezes comprises a repetition of alternating pairs of warriors and pairs of bird or animal figures.

The figures of the warriors are placed feet to feet, their faces turned away from each other. In general the bird and animal figures have their backs towards each other, while they hold what appear to be human hearts in their claws or forepaws. They seem to

be offering these to the warriors whom they face. The warrior figures themselves wear elaborate costumes that still bear traces of the blue, red, and green paint with which they were originally decorated. Staffs or javelins from which plumes descend in long and graceful curves are held in their hands.

A steep stairway, 34 feet wide, containing thirty-six stone steps, ascends the front or west face of the pyramid, at an angle of 66 degrees with the horizontal. Two stone balustrades four feet wide, carved to represent feathered rattle-snakes, rattles at the bottom, fanged heads at the top, flank the stairway. Mounting this one reaches a broad terrace directly fronting the temple portal. Two massive feathered serpent columns, with heads on ground and tufted tail-rattles rising fifteen feet above, divide the temple entrance into a triple doorway.

In front of this awe-inspiring entrance is a reclining human figure, life-size, carved in limestone. Such figures are known as Chac Mools, one of the minor Toltec deities. They are always represented as of human form reclining on back and elbows, with knees drawn up, arms pressed tightly to sides, and uplifted



BEGINNING THE EXCAVATIONS.

The site of the Temple as it appeared two years ago. Workmen are seen beginning operations on the mound in which the structure was buried.

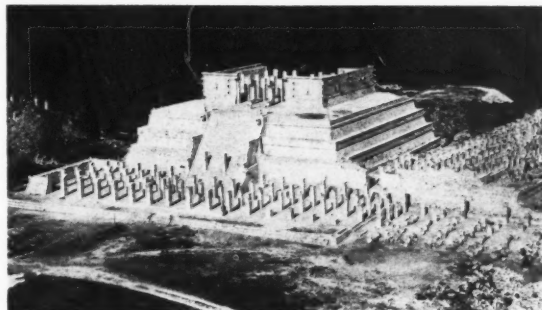


head turned to one side. The abdomen is always flattened or hollowed out, presumably to serve as a receptacle for incense and other offerings.

Passing through this doorway, one enters a spacious hall, 60 feet long, 31 feet wide, and originally probably 22 feet or even more in height. Its corbelled-arch roof is supported by twelve square columns, each sculptured and painted with figures of warriors. This hall gives access, through a carved doorway in its rear wall, to the sanctuary of a temple of the same size as the outer chamber, its roof being upheld by eight square sculptured and painted columns. Against the back wall of the sanctuary is a platform, whether altar or throne has not yet been determined, some 14 feet wide, 8 feet deep, and 2 feet 8 inches high, resting on nineteen painted statuettes, carved in the likeness of human beings. The walls of both the outer hall and this inner sanctuary were originally covered with fine white plaster and then brilliantly painted with scenes of domestic life, of battlefields, and of religious ceremonies. These wall pictures have now been copied, wherever sufficient traces of the original were able to be distinguished.

But this was not all that the Institution's archaeologists found buried in the great mound of debris which concealed this splendid temple. During the first season of work (1925) Mr. E. H. Morris, who was in charge of the excavations at Chichen Itzá, found a square sculptured column buried in the north-west corner of the pyramid, 17 feet below the floor level of the Temple of the Warriors. He surmised then that some earlier building had been dismantled, and filled in to make way for the later and larger construction.

During the 1926 field season this conjecture became a certainty. Excavations in the north-west corner of



THE TEMPLE OF THE WARRIORS.

One of the most beautiful examples of Maya architecture yet discovered is seen here at the close of the 1927 working season, nearing complete restoration.

the pyramid in front of this sculptured column disclosed two other carved columns lying in line with the first. These still preserved their original brilliant hues—reds, yellows, greens, blues, and blacks. Just in front, dismantled and broken, lay the enormous heads and tufted tails of the two great serpent columns which had formerly guarded the portal of this earlier temple. Never before have such colours been seen at Chichen Itzá. It was obvious at a glance that this older temple had been dismantled and buried in the masonry of the pyramid which supports the later Temple of the Warriors, while the paint on it was still fresh and vivid. Because the light of day had not reached it for centuries, perhaps for as many as six, its pigments apparently have been preserved at the highest point of their original brilliancy.

The final excavation of this buried temple was one of the principal activities at Chichen Itzá during the season just brought to a close. The results exceeded the archaeologists' fondest hopes. The Chac Mool figure belonging to this earlier temple was found lying on its back at the southern end of the outer chamber. Except for a broken nose and a broken lock of hair it was in excellent condition. The carving, protected as it has been from weathering, was practically in a perfect state of preservation. The eyes and fingernails would seem to have been made of some sort of an inlay, jade, shell, or obsidian, which, however, had been picked out in ancient times, before the figure had been walled up in this earlier temple.

The walls of the buried temple were brilliantly painted with enormous writhing serpents, while in two places on the wall plaster some idle hand had scratched the outline of a human figure, arms above the head, palms up, as if supporting something. Perhaps this was a study for the Atlantean columns upon which rested the throne or dais that once projected from the back wall. This



DECORATED FRIEZE ON THE PYRAMID FOUNDATION.

The sides of the retreating terraces seen in the upper photograph are faced with stone, decorated to represent eagles, jaguars and other creatures.

throne was completely destroyed when the temple was originally dismantled and the Atlantean figures carried away. There are grounds for believing that they were re-used in the Temple of the Warriors: the nineteen Atlantean figures supporting the throne in the newer structure were too tall for the positions they occupy, so they were buried up to their knees, below the floor level of the Temple of the Warriors. Little dummy feet of stucco were built out from the knees to give the effect that they were standing on the temple floor.

In the sanctuary of this buried temple a sculptured and painted column was found which in brilliance exceeds anything hitherto unearthed in the Maya area. The figure on the column holds a round fan in its hand. Delicate details of costume—embroidery, feather-work, tassels, as well as parts of the body, nails, hair, etc.—are clearly brought out by outline in black against brilliant colours. The amazing effect thus gained is barbaric in its splendour.

Dr. Sylvanus G. Morley, in charge of the Institution's activities in Yucatan, states that it was found that this

earlier temple was roofed over and enclosed by the masonry filling of the pyramid, of which it was a part, in such a way that the original structure was preserved.

The excavation and repair of the Temple of the Warriors is but one of several Maya operations upon which the Carnegie Institution is working. Extensive excavations are being made in a still more ancient part of Chichen Itzá in an attempt to trace the course of the architectural development of the city. Work is going forward also on the repair of the Caracol or Astronomical Observatory, the oldest structure of its kind in the New World. It is hoped that 1928 will see the completion of this undertaking. Expeditions have also been made to distant regions where new Maya ruins have been discovered and examined. Dr. Morley reports that relations of the utmost friendliness and cordiality have been maintained throughout with the Mexican officials under whose jurisdiction the Institution is carrying on this work. A spirit of co-operation and of mutual assistance has developed which will have far-reaching effects in the development of this rich field of archaeological science.

## A Steel Furnace in a Wooden Box.

*A development of unusual interest in steel-making was inaugurated last month at Sheffield, when the first high-frequency electric furnace to be used for the purpose was demonstrated to the Press. A special representative of DISCOVERY who attended here describes the new process.*

THE sun shone through the haze over the city on the 6th December, when a party of a hundred guests arrived at the Imperial Steel Works, Sheffield, to witness a new process, perhaps itself prophetic of a smokeless future for industry. The occasion was the formal inauguration of the Ajax-Northrup high-frequency furnace, the first of its kind in the world to be used commercially for the manufacture of high quality tool steel, which has recently been installed by Edgar Allen and Co.

The ordinary electric furnaces hitherto employed have been used in this country for melting steel for about nineteen years. The first to be erected were of the induction type, but these did not prove satisfactory for British conditions and have long ago been abandoned. Arc furnaces, especially those which are not complicated by the use of bottom electrodes, avoid many difficulties. They are, as far as possible, designed so as to conform with standard basic open hearth practice, except that the source of heat is electricity instead of gas. The men operating this type require no knowledge of electricity, as it is simple

and, mechanically, as robust as possible. In view of the new development, it is interesting to recall that the firm responsible for the latest design had, in 1909, put down the first electric arc furnace of a commercial size to be installed in England. Further, the designs for this original Héroult furnace had been made by Mr. D. F. Campbell, chairman of the Electric Furnace Co., which has now designed and supplied the new high-frequency type.

There was no catch in it!—there it stood, a square wooden box, so cool that one could touch it, yet containing inside it a crucible of molten steel. At a given moment, the wooden box was tilted and its glowing contents poured out into the mould prepared. To describe the process briefly, the steel is melted by a high-frequency alternating current, which circles round the crucible and induces eddy currents in the 450 lbs. of metal it contains. These currents are of such magnitude that the metal rapidly becomes molten, the whole process, from beginning to end, taking about an hour. Except for the low humming of the electric generators from the machinery room



hidden away behind the control board, there was no noise, and the whole seemed vastly different from the older crucible furnace which it replaces. In this, a number of clay pots or crucibles were heated up by coke or gas fires, each pot containing about 60 lbs. of steel. When the steel inside these pots was ready to be poured out or "teemed," a powerful workman stood astride the open furnace, enduring its fierce heat, and drew out the pots by means of special long tongs and his own muscular strength. Other workers single-handed lifted these pots from the ground with the tongs and poured their contents into the ingot mould, the amount of physical force required being enormous.

In the new high-frequency apparatus, the steel is contained in a refractory crucible, or "pot," which is surrounded externally by about an inch of heat-insulating sand. Round this a water-cooled coil is wound, which carries a high-frequency alternating current of electricity, and without any contact between the coil and the steel, heat is generated or "induced" in the metal inside the crucible by means of this current. The walls of the crucible

merely serve the purpose of a container, and no heat is passed from the outside of the crucible to the metal within. This is an important point which will be dealt with later.

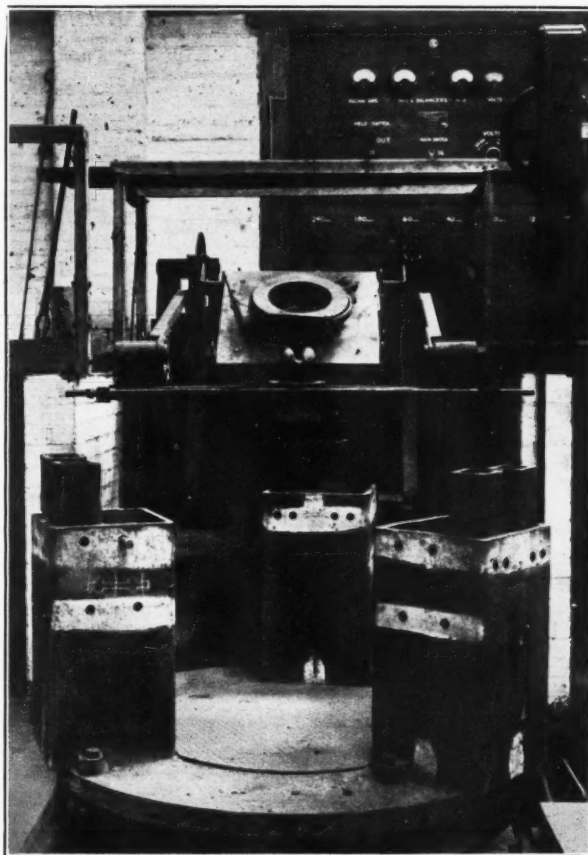
The new Ajax-Northrup design had been employed in America for preparing nickel silver, but has never previously been adapted to high-grade steel on a commercial scale. Apart from observing its more obvious advantages over the ordinary crucible process—which, incidentally, has persisted with only minor modifications for nearly two hundred years—one was

able at the demonstration to obtain some details of the cost of operation. The estimate that the cost per ton of steel produced will be lower, must admittedly remain an assumption until the furnace has been running for some time, but the price of current, about £2 1 s. per ton, appears to be approximately the same as in the ordinary small electric arc furnace. While

the initial capital outlay is heavy, the new process has the advantage that the space required is much smaller than that for plant and buildings needed to produce an equal amount of tool steel by the old crucible method, whether using a gas-fired or coke-fired furnace. The strictly technical advantages must also have a beneficial effect on cost.

The first of these concerns the purity of the steel produced by its means. As there is no contact with fuel, the gases given off by coke, do not penetrate and the steel is remarkably free from its deadliest enemies—sulphur, phosphorus, etc. Secondly, ingots of steel required to conform to a special analysis can be made very quickly, although it must be pointed out that the furnace is purely for melting and not for refining.

Thirdly, there is a violent stirring of the metal electrically, the action being so strong that the surface of the metal in the middle of the pot is about one inch higher than it is at the sides. This ensures a very thorough mixing, so that if, for instance, a high speed steel is being made, the tungsten contained in it is evenly disseminated through the whole of the steel. Great homogeneity of the steel is ensured when making large ingots, such ingots having to be cast by the old crucible process from the contents of several crucibles, whereas in the new furnace, the full heat is cast from



THE AJAX-NORTHROP ELECTRIC FURNACE.

The rim of the crucible is seen protruding from the wooden box (centre), while three vertical moulds ready for the molten metal are on the turntable in the foreground.

the one pot. Lastly, the final temperature of the molten metal can be more closely controlled, while this furnace can be operated intermittently with very little loss and the use of heat gauged in a way that was hitherto impractical.

This point was dealt with by Professor C. H. Desch, D.Sc., F.R.S., in a speech at the luncheon that followed the works visit. The older induction furnaces, he said, were cumbrous appliances of lower efficiency. In the new design, the current consumed was remarkably low, as the heat was generated exactly where it was wanted and waste was thus eliminated. In mentioning that the metallurgical department of Sheffield University had previously had the first experimental high-frequency furnace in the country, he went on to illustrate the efficiency of the method. The capacity of the model was, smaller, only 12 lb., but the lid of the crucible had actually been removed with the fingers, at the point when the metal it contained had just become molten. The crucible was always cooler than the metal it contained, owing to the heat depending on induction in the metal itself. "I believe," Dr. Desch concluded, "that the new furnace has a very decided future as an implement of the greatest value to the steel-maker."

The characteristics dealt with were borne out by the demonstration, when the molten metal was poured out into the vertical mould without even marking the wooden box container; this had, of course, been arranged to illustrate the heat efficiency, and was not in practice a necessary part of the furnace.

### The late Sir Arthur Shipley.

*Professor E. W. MacBride sends the following account of the scientific aspects of the late Sir Arthur Shipley's career, which was reviewed from another angle in an editorial appreciation last November.*

I FIRST made the acquaintance of Sir Arthur Shipley (then plain Mr. Shipley of Christ's) in the autumn of the year 1888, when I entered Cambridge as an undergraduate. He was then the demonstrator of comparative anatomy, and he gave me my first instruction in practical invertebrate zoology. Later I attended during two years his lectures on advanced zoology. After I had taken my degree in 1891 I proceeded to Naples, and on my return to Cambridge in 1892 I was appointed demonstrator in animal morphology, and became for a brief period Shipley's colleague. In 1893 Shipley and his close friend Harmer (now Sir Sidney Harmer, F.R.S.), undertook the task of editing the *Cambridge Natural History*, a most comprehensive work which was eventually completed in ten volumes, the publication of which extended over a period of nearly twenty years. The compilation of this work was one of the most valuable services rendered to the science of zoology, as it codified our knowledge of the habits and structure of all the phyla of the animal kingdom, and it was presented in readable form, abundantly illustrated. Shipley contributed articles on the groups in

which he was specially interested, *viz.*, the Nematode worms, the Brachiopoda, the smaller groups of the Arachnida, and the Gephyrea. His articles are models of clear exposition. To-day, thirty years after the publication of the article on the Nematoda, I find that it still forms a most invaluable foundation for our knowledge of the group, and one to which I have constantly to refer.

In 1893 Shipley published his textbook of the anatomy of the Invertebrata. It was a most valuable book, and exemplified his grasp of really important facts and his sense of the necessity for brevity, clearness, and the exclusion of irrelevant detail. At the time of its publication the textbooks available for students were large, diffuse, and cumbered with an enormous accumulation of structural details which no student could properly memorize and which were calculated to leave in his mind the impression that the science of zoology consisted of a vast mass of undigested facts. In 1896, at his request, I collaborated with him in the preparation of a new textbook of zoology which included the vertebrates as well as the invertebrates, and the first edition of which was published in 1901. Shipley began his researches at a time when the great school of comparative embryology founded by F. M. Balfour at Cambridge was still in the first flush of its glory. At that time, to use words applied to another revolutionary epoch, what joy it was to be alive, what a heaven to be still young! Whilst Sedgwick was carrying out his epoch-making researches on Peripatus, and Bateson was startling the world by proving that *Balanoglossus* was a link between vertebrata and invertebrata, and Harmer was introducing us to the marvellous antics of the developing *Polyzoon*, Shipley began to work at the development of the lowest fish, the lampreys. During the course of this research he recognized and emphasized some points of fundamental importance in the understanding of vertebrate anatomy. He showed that the cavity of the heart, and inferentially therefore of all the other blood-vessels, was merely a remnant of the primitive segmentation cavity of the egg. He also showed that the repetition of muscle segments (myotomes) and of gill slits were entirely independent phenomena, and that the "segmentation" of vertebrata had no relation to that of "worms," as the then popular theory of the evolution of vertebrata presupposed. This clear-sightedness leads us to regret that Shipley did not persevere in his study of the vertebrata. But his heart lay in other fields. He was possessed with the strong desire "to tidy up" obscure and little understood corners of the animal kingdom, so he began to investigate the anatomy of the Gephyrea. I have still the notes of his lectures on this curious group of "worms"; they are as clear and informing to-day as when they were written. He investigated the anatomy of the Nematoda and of the curious Arthropod group the Pentastomida, and he made some pioneering researches on the development of the Brachiopoda. One reason for this choice of subjects of research was that Shipley saw with a clarity denied to some of his Cambridge contemporaries, that the original enthusiasm for evolutionary research would inevitably slacken and that it was of the highest importance to direct attention to animals which were of economic importance, even if that importance was due to their depredations as pests. His further services—developed after I left Cambridge—in building up a school of economic biology, and in organizing the opportunities for the employment of Cambridge biologists in other capacities than that of professors and teachers, came to fruition whilst I was in Canada, but to do justice to them would lead us outside the scope of this article.

## A Defence of Stefansson's Discoveries.

By George H. Wilkins.

*Leader of the Arctic Airplane Expedition.*

*The following details of the "blond Eskimo" and other discoveries have been received in support of Stefansson, "whose veracity more than his method of Arctic travel has been attacked in Amundsen's recently published autobiography." Captain Wilkins accompanied Stefansson on the journey under discussion, and we gladly publish his statement not to promote controversy but in the interests of polar research.*

IN Roald Amundsen's autobiography, entitled "My Life as an Explorer," there is the following statement :

"My experience leads me to believe that the two famous 'discoveries' of Vilhjalmur Stefansson should be taken with many grains of salt. I refer respectively to Stefansson's widely heralded 'Blond Eskimos' and to his equally famous 'Friendly Arctic.'

### The Blond Eskimo.

"To deal with the 'Blond Eskimos' first. It is, of course, not beyond the bounds of possibility that some small tribe of Eskimos might have escaped the observation of white men heretofore, but to say that this is likely is to stretch the possibilities much too far. Such statements should be supported by positive proof, and I have heard of no such proof. . . .

"Stefansson's 'Blond Eskimos,' it seems to me, is simply a far-fetched idea. His 'Friendly Arctic,' however, is likely to give dangerous ideas to inexperienced explorers. No gullible person will come to any harm by believing that some Eskimos are blond. But it is entirely possible that some adventurous spirits, seeking a fresh thrill in the North, may be misled by this talk about the 'friendliness' of the Arctic, and will actually attempt to take advantage of this 'friendliness,' and venture into those regions equipped only with a gun and some ammunition. If they do, certain death awaits them. In my opinion, based on long experience and careful study, even a good marksman cannot 'live off the country' in the Arctic. It is conceivable, I suppose, that a very skilful and experienced explorer, in extraordinarily favourable circumstances, with weather and game conditions just right, and close to solid land, might for a very short time 'live off the country,' but I would not try it myself. I would consider it sheer suicide. I do not believe it can be done." (pp. 227-228)

In an edition of the book, written in Amundsen's native language, he makes his meaning more clear. A skilful translation from the Norwegian reads :—

"Stories of the polar regions must be read in the light of the explorer's previous career. I have written the preceding section (about Peary and Cook) partly

to make it clear why it is that I always characterize the first of Vilhjalmur Stefansson's famous 'discoveries' as about the most unmitigated nonsense that ever has come out of the North, and his second not merely as nonsense but in addition the most harmful and dangerous nonsense. I refer to his widely circulated book, 'The Blond Eskimos,' and his also similarly famous, 'The Friendly Arctic.' . . .

"Stefansson's yarn about a special race of blond Eskimos deserves no more serious consideration than a sensational piece of news in a yellow journal. Stefansson's 'Blond Eskimos' are merely an amusing produce of his imagination. 'The Friendly Arctic' is, on the other hand, a dangerous misrepresentation of the real conditions. No gullible person will come to harm through believing that some Eskimos are blond. But it is entirely possible that some adventurous spirits, seeking a fresh thrill in the North, may be misled by his babble about the 'friendliness' up there, and will actually try to do what Stefansson says he has done, namely, to go adventuring into these regions equipped only with guns and a little ammunition. If they do, certain death awaits them. Stefansson has never done it, in spite of the fact that he says he has. I am willing to stake my reputation as a polar explorer, will wager everything I own, that if Stefansson were to try it he would be dead within eight days counted from the day of starting, if only this experiment takes place on the polar ice, which constantly is adrift over the open sea."

These statements question two things: Whether it is possible to live by hunting on the Arctic sea-ice out of sight of land, and whether Stefansson has done the things he says he has done.

It was my privilege to be with Stefansson's Canadian Arctic Expedition at the start of the ice trip described in his "The Friendly Arctic" (commencing on page 142). I can verify Stefansson's figures as to the load at the start, and I have every reason to believe that his statement on page 163 is also correct.

Stefansson's diary shows that on 7th April he had full rations for three men for about thirty days and dog feed for forty days. 26th April—nineteen days



later—his diary records, "We were two hundred miles from Alaska. We had provisions for two weeks only and signs of game getting fewer every day." Up to that point they had been getting seals, but from there on, in their hurry to reach Banks Island, they saw few signs of game until 7th May. Still two hundred miles from land and when young ice barred their way, Stefansson saw a seal. On 13th May they saw many seals; two were killed, but they could not retrieve them. The dog feed by that time was finished. They had fed the dogs on boots, bearskins, and other bedding. The men were living on less than three-quarters of a pound of food per day. On 15th May, it had come to a show-down. They were practically without food; by calculation they had less than three pounds of edible food with them. They were still some hundred and twenty miles from the nearest point of land. By sheer necessity they stopped to hunt. They killed two seals and lost them, but retrieved the third. The seals they had killed between 7th and 15th May had sunk, but after securing one Stefansson learned that it is necessary to shoot seal through the brain in order that it may readily float; even so, some seals killed in the summer will sink. Once having discovered the method of killing there was apparently no trouble to provide the party of three men and six dogs with ample food.

#### Hunting on the Sea-ice.

It was not until 25th June—forty-one days later—that the party reached the shore. For a period of almost six weeks they had undoubtedly maintained themselves by hunting on the Arctic sea-ice, out of sight of land.

It was the 11th of September—eighty days after reaching land and one hundred and twenty-one days after the food supply had totalled three pounds—that Stefansson arrived at the schooner, "Mary Sachs," then wintering at Cape Kellett, Banks Island. Stefansson, Storkerson, Andreason, and their six dogs had come through safely and they were unquestionably fatter and appeared in better health and better fed than when I left them on the ice some six months before.

We have the corroborative evidence of five men—Storkerson, Andreason, Crawford, Johanson and McConnell—that Stefansson's food supply on 6th April did not exceed thirty day's full rations for three men. Even Amundsen must agree that there was no means of replenishing their store of civilized food.

Stefansson, Storkerson, and Andreason are alive to-day, after having maintained themselves for forty-one days by hunting on the sea-ice and for eighty days on Banks Island; a record clearly stated

in Stefansson's book and which anyone can prove. Yet, in the face of this, Amundsen publishes a statement translated as follows:—"But it is entirely possible that some adventurous spirits, seeking a fresh thrill in the North, may be misled by his babble about the friendliness up there, and will actually try to do what Stefansson says he has done; namely, to go adventuring into these regions equipped only with guns and a little ammunition. If they do, certain death awaits them. Stefansson has never done it, in spite of the fact that he says he has."

Amundsen himself, in his book "Our Polar Flight" (on the Amundsen-Ellsworth 1925 Expedition by airplane), supplies evidence of having seen a seal within a hundred miles of the North Pole, and Lincoln Ellsworth, in his story of the transpolar flight, tells of having seen a bear's track in the vicinity of the Pole of Inaccessibility—some five hundred miles from land. But, whether or not seals in number and bears may be found further than two hundred miles from land; whether the policy of living off the country while engaged in scientific work in the Arctic is sound, is not the purport of this dictum.

It has been my privilege and pleasure to find in Stefansson a careful and accurate scientific observer, whose statements of fact have at times been misquoted and misrepresented in newspapers, but whose books, when carefully read, impart reliable information and tend in no way to mislead the public or adventurous spirits seeking knowledge of Arctic conditions.

Amundsen says "Stefansson's blond Eskimos are merely an amusing product of his imagination." I lived on Victoria Island with an Eskimo tribe, among which were two women, three girls, one boy, and a man with light brown hair, blue eyes, fair skin, and rosy cheeks. Some of these people assured me, through an interpreter, that they were old friends of Stefansson's. Other scientific observers who have seen some of these people are Diamond Jenness and Knud Rasmussen. There are many other reliable witnesses. There is no occasion to imagine "Blond Eskimo"; even casual travellers in the district they inhabit know they exist, although the origin of the blond characteristics is yet to be proved. Several scientific observers are inclined to agree with Stefansson's opinion that the blondness is due to the influence of Viking blood from Greenland.

Amundsen, in his book, implies that Stefansson is guilty of wilfully mis-stating facts. Let me assure Amundsen and the public that evidence fully supporting Stefansson's statements can be obtained from the six members of his expedition who are in possession of the facts.



## Correspondence.

### BROADCASTING AND MUSIC.

To the Editor of DISCOVERY.

SIR,

Among the many subjects that *Discovery* has introduced to notice within recent months, none are calculated to make a wider appeal than Mr. Edward Liveing's series on that new phenomenon which has emerged on our civilization as an agency in our social life of tremendous significance. Had Mr. Liveing been content to claim, in his introduction to "Invisible Music," that his article "is definitely that of a layman in music, but a music-lover," it would have been accepted and allowed to stand for what it is—a very agreeable and valuable essay on a widely popular and fascinating topic. But, when he continues and says "it is possible that a layman can look at some of the fundamental issues involved in the effect of broadcasting on music more neutrally than a musician," he invites a challenge on the very ground on which he claims immunity from the suspicion of bias or partiality—that of being neutral. For Mr. Liveing writes as something more than a mere layman; he is a servant of the British Broadcasting Corporation.

It is the broadcaster Mr. Liveing and not the layman Mr. Liveing who exclaims, "one can look forward to the day when broadcasting in all countries of the world will be the prime mover in musical life, *if, in fact, it is not already so to-day*" (the italics are mine). Our musical life is made up of more than music lovers and listeners; the real musician is the performer, the interpreter, and until broadcasting has produced the interpreter in addition to the listener it will not be possible for it to claim to be more than one factor making for progress. Indeed, the change being brought about may not spell progress. There are many things in broadcasting that cause us to speculate, but he would be a rash man indeed who, at this stage, were to say prophetically whether broadcasting is to aid in the coming of the musical millennium or is to threaten its disaster.

Surely it is also the broadcaster and not the layman who argues for invisibility by saying that "the very lack of visual images places the listener more closely in touch with the mind of the composer himself when he first conceived the music"? Here is a confusion and a fallacy. Besides which, it may be pointed out that Nature, without waiting for the marvellous adventitious aid of the broadcasting apparatus, has already provided a ready means of procuring invisibility in the performer. It is only necessary to resort to the simple expedient of closing the eyes or looking in another direction, to produce exactly the same effect as the broadcast performance. The confusion lies in the delusion that "the listener hears the melodies and harmonies as they first took their texture in the creator's mind." This merely restates the old fallacy that the notes are the music and the music is the notes. The disinterested layman in music, but a music-lover, will reply that he hears nothing else than what the interpreter pleases him to hear. No performer gives an interpretation to any but his own conceptions of what the composer has in mind. It matters not whence conceptions come. What he gives us is not "the music" but his idea of the music.

Then Mr. Liveing's views on opera, which make him suggest that "broadcast opera offers a satisfying alternative to stage productions" to those who regard opera as a hybrid art, are open to comment. The term "broadcast opera" is deliberately used more than once to distinguish it from the hybrid kind,

but that does not shield him from the criticism that what the broadcast offers is not opera at all, but the music of the operatic composition. In the opera music is but one among several partners engaged in producing the total effect; poetry, scenery and action at once, and in combination, make clear the meaning of all that is done and sung. Therefore it is beside the question to talk of the constituents excepting music as "discordant elements," and special pleading to suggest that "broadcasting has come to keep the art form alive," when what is offered is not even a shadow of an abbreviated hybrid; only a limb or branch of the main body. All the most refined arts are called in to contribute to the opera idea, and inasmuch as "broadcast opera" is not representative of an art-form which rests not in music alone but in the visible beauties of action, as they may be expressed by the painting of scenery and the grouping of human figures, the credit of broadcasting in relation to opera which the Director of the Manchester Station, B.B.C., seeks, is one that cannot be allowed.

Yours faithfully,

Palmer's Green, N.

HERBERT H. WARDLE.

13th December, 1927.

### THE STONE AGE IN EAST AFRICA.

To the Editor of DISCOVERY.

SIR,

With reference to the strata in which Messrs. Leakey and Newsam discovered important Stone Age remains in Kenya, it is stated on p. 330 of your issue for October, that I am inclined to attribute "an even earlier dating to the deposits than is Mr. Leakey at present." This is not so; in fact, the exact opposite is true.

According to Mr. Leakey, Elmenteita cave-man, by which I mean the extinct race revealed by human remains at the bottom of the excavations in the Elmenteita cave, is pre-Riss in age, while according to my showing he cannot be older than Riss. Similarly, Mr. Leakey makes his Elmenteita B man Würm in age, while I regard him as post-Würm.

I have been working on the Stone Ages of Uganda at intervals for the last nine years, and one of the difficulties, which at last appears to be solved, is the disentanglement of the effects of earth-movements and pluvial periods, as recorded in the present disposition of terrace gravels. It may now be declared with considerable confidence that there is sound evidence of two pluvial periods in Uganda, and some evidence, not entirely conclusive, of a third. All of these fell within human times. In the Nakuru-Elmenteita area the issue is not fogged by tectonic effects, and the evidence appears to be plain. I have little doubt that the great pluvials were a climatic phenomenon of the Great Ice Age; but I feel less sure to-day than I did a few months ago that the "Third Pluvial" is one of these; I am rather inclined to regard it as a post-glacial event. Should this prove to be the case, it would seem that the dating of Mr. Leakey's finds must all be pushed forward one period. Clearly this is an important matter to decide.

Yours faithfully,

The Geological Survey of Uganda,

E. J. WAYLAND.

Entebbe. 7th October, 1927.

### THE TRAVELS OF DISCOVERY.

Miss A. F. Bryant (Kings Langley, Herts.), writes to the Editor:—"It may interest you to know I send my copy on to (1) the British West Indies; (2) British Columbia; and sometimes (3) Tasmania."

## Stageless Drama and Pageless Literature.

By Edward Liveing, M.A.

Manchester Station Director, British Broadcasting Corporation.

*In a further vigorous article, Mr. Liveing outlines the factors that characterize broadcast plays as a distinct new art, of which the full significance has yet to be discovered. His previous contribution on music is discussed by a correspondent elsewhere this month.*

SOME of the most interesting features of development in broadcasting are the revival of old art forms and the modification, or extension, of existing means of self-expression. While perhaps the social importance of broadcasting is more obvious in its religious services, talks, and news bulletins, the work which it is doing in apparently less significant channels will be found, sooner or later, to be exercising a profound effect on the literature and the drama of the day.

### A New Art.

In the early days of broadcasting it was natural that the broadcaster should have turned to the existing traditions set up by his predecessors in the various forms used to express the currents of social life. Thus we find, for instance, that existing plays were adapted somewhat haphazardly to the wireless medium. Foreign broadcasting organizations have, in fact, paid very little attention to the potentialities of radio drama since their inception. The British organization, and to some extent the German, have very definitely appreciated the fact that radio drama is a new art form and that, while at the outset the adaptation of the traditions of the stage served useful purposes, the art is now essentially an art of its own. To the person who is not blessed with imagination, radio drama has nothing whatever to offer, but to him who can, in the words of the Prologue to Shakespeare's "King Henry the Fifth":

Piece out our imperfections with your thoughts,  
Into a thousand parts divide one man,  
And make imaginary puissance;  
Think, when we talk of horses, that you see them  
Printing their proud hoofs i' the receiving earth;  
For 'tis your thoughts that now must deck our kings,  
Carry them here and there, jumping o'er time,  
Turning the accomplishment of many years  
Into an hour-glass.

the broadcast play offers a reflection of life which could not otherwise be obtained. The auditorium is your room. Turn out the light and the fire becomes your footlights, while the darkness, stimulated by sound, offers a multitude of scenes which could never be portrayed on affairs of canvas and wood. By its very lack of scenery the radio play gains in the width

of its dimensions. Like the cinema play, it can only appeal to one sense, but again like the cinema play, this very fact frees it to shift its heroes and heroines and characters from scene to scene and climax to climax in a way that is entirely denied to the stage play.

As I have pointed out, other broadcasting organizations in other countries have paid but scant attention to the development of this new form of art. In Great Britain it has been taken seriously both by listener and broadcaster. On the one hand, the technical apparatus needed for reproduction of background noises, and on the other hand the adaptation or special writing of the plays, have both made great progress. In particular, the plays that are now transmitted from the Head Office of the organization in London are dealt with technically in the most comprehensive and complicated manner, separate studios being used for actors, effects, orchestra, and artificial echo respectively, and the *ensemble* of noises from the studios being controlled by the producer and given their due proportions by him through the use of a special "mixer."

### Present and Future.

From the ground which has already been gained, and the experiences that have accrued to us, it would appear as though there are two possible main lines of development in the present and future. The form of drama which has been strongly advocated by Gordon Lea in his very stimulating little book on "Radio Drama" is that of what he calls "the self-evolving play." In a play of this kind, the aid of the announcer or story-teller to introduce scenes and action is dispensed with altogether, the voices of the actors themselves informing the listener at the start of the play, or during its course, of its location, of the time, and of all other essential details. At the opening of such a play we would hear a girl character inquiring of a man character where he is in such words as "I am looking out of the window, but I cannot see where you are"; to which the other character would reply, "That is not very likely, because I am trying to get the wireless aerial disentangled from the shrubs at the bottom of the

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garden." This is, of course, simply a crude and elementary example of the methods that can be used. My own opinion is that, though this method is theoretically excellent, it is by no means practically sound, certainly not practically sound for long plays or plays of an episodic nature. The other line of development, and the one which I think is more likely to proceed successfully, is that of what might aptly be called the "illustrated wireless story." It finds its parallel quite definitely in the cinema play. The carefully written announcements of the storyteller, which enable the broadcaster and the listener to bridge over gaps of time and space, fulfil the same objects as the sub-titles of the cinema screen, introducing the audience to the first scene and subsequently to the other important scenes; the well-differentiated voices of the actors with the necessary noise effects produce the various scenes, and the introduction of music into certain of such plays or wireless stories at the proper moment provides the emotional background. The earliest crude experiments leading towards such a type of wireless programme were conducted in the United States, where radio versions of cinema plays were given in order to advertise these in advance. An experiment of this kind was made by the Manchester Station in 1926, when a broadcast version was given of the film-play, "The Greater Glory." Subsequently very remarkable progress has been made at London and other stations in the development of this art form, Cecil Lewis's adaptation of Conrad's novel "Lord Jim," and the adaptations of Shakespearean plays, being examples which may be specially cited. There is, to my mind, a great future for radio drama of this character.

Many unexpected difficulties were encountered in the early days in regard to accurate reproduction of sounds and noises to illustrate plays. It was found, for instance, that a knock on a door by a human hand sounded more like a knock on a box and that a pistol shot entirely lost its actual piercing sound over the microphone. There are in fact very few noises which

can be reproduced faithfully over the microphone and substitute noise-effects give a much more accurate sensation. Even were it possible to illustrate every wireless play, the action of which is placed near the sea, by putting a microphone down on the shore to relay the breaking of the waves, it would be found that this would in no wise be as satisfactory as the revolving of loose shot in a sieve. Through careful and continuous experiment apparatus has now been evolved to produce nearly every type of noise required in the average play.

What future is there for the wireless play-wright and the wireless actor?

It is obvious that the immense fees paid to stage dramatists for plays which in most cases have long runs, cannot possibly be paid for only one or two performances rendered by a wireless organization. It has therefore been no easy matter to persuade well-known dramatists to write plays for the wireless or to have their plays adapted to this medium. This is a serious problem, but it is to be hoped that play-wrights of the future will recognize that, even though not so financially inviting as stage plays, wireless plays



MANCHESTER STATION REPERTORY PLAYERS.

In the scene here shown from "Independent Means," the players before the microphone are dressed in costume to help them obtain the stage atmosphere.

offer much freer scope for plots and even in some respects for characterization, and that their audience in this respect is nation-wide and world-wide rather than one held within the four walls of a theatre. So far, too, as English plays are concerned, copyrights of these can be sold not only in Great Britain, but also in the United States and in the several countries of the British Empire. At least it may be said that the wireless medium has made fame for more than one young play-wright, and that in at least one instance it has been responsible for a long play that has subsequently been reproduced on the stage, "The White Chateau."

And for actors, too, the wireless offers certain definite advantages. One of the most essential points in the presentation of wireless plays is the very careful differentiation between the voices of the various characters, since this is not only the guide to the listener to distinguish between the characters,

but also the means of bringing out the personalities in a cast to the fullest possible extent. Personality in voice is essential to the wireless actor; suitable appearance is not. Many well-known stage players are frequently employed and also many players who have not had great stage experience, but who seem to realize intuitively the fact that the voice is the one medium for conveying personality to the unseen audience, and that the wireless play is something which must give an impression to the listener that he is over-hearing events taking place somewhere or other in the lives of individuals outside the four walls of his room.

At the beginning of this article I said that broadcasting was responsible for reviving old art forms. Its incursions into literature make a good example to illustrate this statement. If we trace the origin of the novel to its earliest sources, we picture the ancient story-teller in the market-place or at the wayside, standing on an upturned box or large stone and using every trick, not only of gesture, but also of voice, to attract and to hold the attention of his audience. The wireless story-teller of to-day finds himself—or should find himself—in much the same position as that of his early predecessors. But he is robbed of all appeal through bodily or facial gesture; and he must fall back on making the fullest possible use of that wealth of stimulating properties possessed by the human voice. It is an unfortunate fact that bound and printed volumes have thrown so large a gulf between the ancient and the modern methods of story-telling and between the ancient and modern story-teller. If the wireless story-teller wishes to bring his story home to the heart of the listener, he is well advised to dictate it to a friend or a secretary first and to watch its effect in the course of delivery. If more attention were paid to simplicity of plot and presentation and less to ornateness of language, the appeal would be found to be much greater, and this without any loss of style. Ability to ring every change of emotion through voice inflections, and simplicity and forcefulness of style, are the essentials in the wireless story-teller's outfit.

#### The Wireless Novel?

The short story has come to stay in wireless programmes; but whether the wireless novel has any future in front of it remains to be seen. An abbreviated version of a novel by A. E. W. Mason was read nightly for a week over the broadcasting system of this country some year or so ago. One of the chief problems to be overcome in relation to wireless serials is the drawing up of a synopsis of such

a nature that its length for the introduction of the final chapter is little greater than that employed for the introduction of the second. The whole idea is somewhat akin to the one-time "penny-readings," which certainly had a remarkable vogue in their day. Perhaps the running of such a feature over the microphone would bestow more benefits on the regular reader than on the regular listener, for it might quite possibly exercise a salutary effect on the verbosity of the average modern psychological novel. But the whole problem of serial narratives is one that may happily be shelved until the materialization of schemes for supplying alternative programmes to all listeners.

#### Possibilities of Poetry.

In passing to the subject of the broadcasting of poetry, I must admit personal uncertainties. Some months ago I regarded the possibilities of successful broadcasting of lyrical poetry as very shadowy indeed. To-day my doubt is not so definite and I think that, at the suitable moment and with the suitable reciter, the possibilities of success are considerable. Three factors must be taken into consideration:—(a) The lyric is the rapid expression of a surging mood; (b) That mood will almost certainly not be the mood of the majority of listeners when the poem is recited unless it has been carefully fostered by the preceding items, musical or otherwise, in a programme, or unless (a still better alternative) it fits in with an important occasion on which the social consciousness has been directed towards a certain goal of thought and feeling. An example would be the reading of one of Rupert Brooke's 1914 Sonnets in an Armistice Day programme; (c) As already emphasized in preceding articles, the appeal of broadcasting is to the individual to whom the approach must be intimate and friendly. Declamation of lyrical poetry as though to a large audience at once strikes an artificial note and is absolutely fatal. I need not point the obvious inferences to be drawn from these remarks. The broadcasting of narrative poems presents a considerably less difficult problem. Elasticity in voice inflection, enabling every dramatic point of the story to be brought out of the full, clarity of diction, and a good imagination are the chief requirements of the wireless reciter of narrative poetry. In the course of time we may see the rise of a school of broadcasting poets, just as we may also see the rise of a school of composers of music for this medium. We are, as yet, only on the threshold of the temple. Developments in broadcasting follow closely on the steps of one another, and, as in all activities of life, ideas which appear far-fetched to-day become the institutions of to-morrow.

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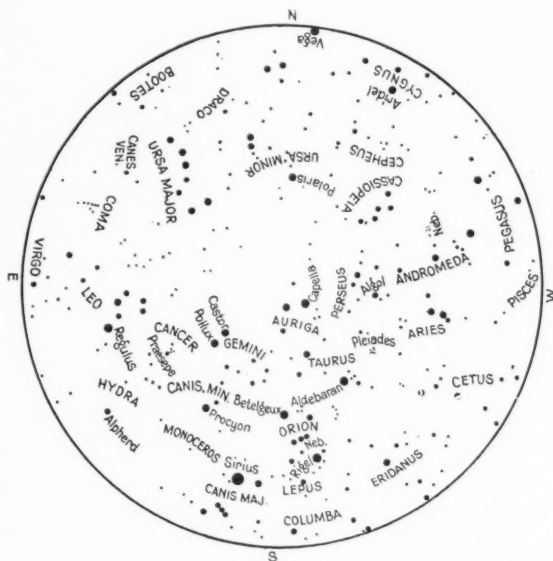
## Among the Stars: A Monthly Commentary.

By A. C. D. Crommelin, D.Sc., F.R.A.S.

*Late of the Royal Observatory, Greenwich*

### THE FACE OF THE SKY FOR JANUARY.

THE star-map (for 6 h. sidereal) has the two equinoctial points on the eastern and western horizons, and the most northerly point of the ecliptic (the First Point of Cancer) due south; this point is in the feet of the Twins; it was close to it that Uranus was discovered in 1781. Jupiter has now passed out of the monthly map, but may still be observed in the early part of the



THE FACE OF THE SKY AS SEEN FROM LONDON at 6 hours sidereal time: that is, at 11 p.m. on 6th January; at 10 p.m. on 21st January.

night. Mercury may be seen as an evening star at the end of the month; it must be looked for as soon as possible after sunset. Neptune is very close to Regulus on the 8th; it will be interesting to trace its daily motion at that time. Encke's comet may be visible in moderate instruments when the moon is not up. The following ephemeris for 0 h. (that is, the midnight at the beginning of the day) is from the B.A.A. Handbook; 10th January, R.A. 22 h. 46.4 m., N.Decl.  $3^{\circ} 51'$ ; 18th January 22 h. 51.2 m., N.  $3^{\circ} 45'$ ; 26th January, 22 h. 54.7 m., N.  $3^{\circ} 16'$ . It must be looked for as soon as it is dark.

### New Comets.

A comet of the third magnitude, with a tail 3 degrees long, was discovered by Mr. J. F. Skjellerup at Melbourne on 3rd December; it was 54 degrees south of the equator, but was moving northward, so may become visible here. No further information can be given as yet. Ten comets have now been found during 1927; this number has only once been

exceeded, in 1925, when eleven were found. Four of the ten were expected periodic comets; the other six were new, but one of them, discovered by Mr. W. F. Gale in Sydney, proves to be a short-period one (period about eleven years). A comet discovered at Bergedorf by Prof. Schwassmann and Dr. Wachmann on 15th November, seems to have a remarkable orbit; the values so far published indicate that it passed its perihelion one and a half years before discovery, and is now well outside Jupiter's orbit; its motion was, however, so slow that the orbit is still uncertain. It is not quite impossible that the comet discovered by Skjellerup (mentioned above) is identical with the one discovered by De Vico in 1846; this comet has been expected for some years. Skjellerup discovered several comets when he lived in South Africa, but this is his first since he went to Melbourne.

### New Star in Taurus.

Besides their discovery of a comet, Prof. Schwassmann and Dr. Wachmann also discovered an interesting Nova in Taurus on 18th November, in R.A. 5 h. 15 m. 12 s., N.Decl.  $16^{\circ} 38'$ , magnitude 10. As it happened in previous discoveries of Novae, so in this, the immense stores of photographic plates at Harvard Observatory have added to our knowledge of the earlier history of the outbreak. Miss Cannon announces that previously to September last the star was invisible on the plates, and was not brighter than magnitude 15. It was first found on a plate of 11th September, when its magnitude was 11.7; its rise was less rapid than that of some Novae; on 25th September it was 8.2, and on 30th September it reached its maximum, which was 6.0. Its decline set in without delay, by 9th October it was 7.2, by 20th October, 7.6, by 4th November, 8.5. It was, therefore, a naked-eye star at the end of September, but at that time it was on the meridian at 5 a.m., so was outside the region that most observers explore. Its spectrum was photographed with the 24-inch reflector at Harvard on 20th November; the hydrogen lines were bright. The position, like that of most Novae, is quite close to the Milky Way, about 11 degrees from its central line. Other recent Novae in the same general region of the sky are those found in Gemini in 1903 and 1912, and that in Monoceros in 1918. The phenomena exhibited by Nova Pictoris are thought by most astronomers to indicate that the outbreak arises from internal rather than external agency, some unusual conditions causing abnormal heating, and consequent rapid expansion.

### Jupiter Phenomena.

Mr. B. M. Peek and Rev. T. E. R. Phillips drew attention, at the November Meeting of the British Astronomical Association, to the interesting phenomena on Jupiter at the present apparition. There have been numerous small white spots on the equatorial belt, and these have shown a rate of motion intermediate between the equatorial rate, whose period is 9 hours 50 minutes, and that of the temperate zones, which is 5 minutes longer. Also the rate of these spots was found to

vary, as though they were gradually coming under the influence of a zone different from that of their origin.

### Double Stars.

Those who are interested in this subject will find an important contribution to it in "Publications of the Yerkes Observatory," Vol. V, part i. This contains observations of about 3,000 doubles made with the great refractor by Prof. G. van Biesbroeck, who is a most diligent worker, since he has also been assiduous in observing comets during recent years. The stars selected for observation are naturally the more difficult pairs; in particular he has reobserved the binaries that were detected by Prof. Hussey about the beginning of the century; many of these show some change of position which enables an estimate to be made of their hypothetical parallaxes, and probable distance; such estimates are given in all cases where possible. There are also a number of newly computed orbits.

The system 37 Pegasi is one where the orbit is turned edgewise to us, so that the motion is simply oscillation in a straight line. The period is found to be 150 years. 70 Ophiuchi is a star that has led many computers to deduce the existence of a third unseen companion from deviations between theory and observation; Prof. van Biesbroeck does not regard this hypothesis as necessary. He gives a new orbit of  $\lambda$  Ophiuchi, with a period of 150 years; but he has found it necessary to omit the observations of Sir W. Herschel of this star, as they seem to be affected by some error that cannot now be corrected. Double stars are the only means of determining the masses of the stars, and hence of verifying the important proposition reached on theoretical grounds by Prof. Eddington, that the "Absolute Magnitude," or total light emitted by a star ought simply to depend on its mass. A corollary of the theory is that stars turn a considerable portion of their matter into energy in the course of their career, so that their mass gradually diminishes.

## Book Reviews.

*The Earth: Its Nature and History.* By EDWARD GREENLY, D.Sc., F.G.S. (Watts & Co. 1s.; or 7d. in paper covers).

Unlike many books, this little work (one of the "Forum" Series) by Dr. Greenly is exactly what its title leads one to expect: it deals clearly and concisely with the nature and history of the earth. In fifty-four small pages we have an account of the materials of which the earth is composed, of the manner in which they were formed, and of the changes in character and in situation which they have undergone. This is followed by a description of the processes by which the present surface features of the earth have been developed, and by a brief resumé of the history of the living things it has supported. Geological structures and the relation which exists between rocks and scenery are adequately illustrated by means of a few well-chosen, clearly drawn, and lucidly described sections.

Although it covers essentially similar ground, the present work is not a textbook of geology; it is, rather, an epitome in simple language of the contents of such a textbook, and it is intended, as the author states in his prefatory notes, "for the general reader who desires to know something of what has been ascertained by Geology concerning the nature and history of the Earth, and of the methods by which that knowledge has been acquired." That was the author's aim, and he has successfully accomplished his task, for the vivid word-pictures he gives of the operations of the rock-forming and rock-destroying processes cannot fail to appeal to any intelligent reader; but in addition to that, the book should appeal to the student and to the trained geologist, because of the admirable way in which it summarizes the aim and scope of geology.

A very useful feature is an appendix with suggestions for further study; in addition to references to works on geology, it contains the very practical suggestion that museum collections should be consulted in order to enable the reader to make himself acquainted with the significance of the mineral and rock names which so frequently occur in geological literature, and it reminds the reader that neither books nor museums can take the place of "what we see along the countryside and under the open sky."

The book is obviously the work of an outdoor geologist—one who has studied the rocks as carefully in the field as in the laboratory—and as such it combines two qualities not usually found in a single book. Not only is it a book for the fireside,

but as a running commentary upon natural features it is an excellent travelling companion. This is probably to be explained by the fact that Dr. Greenly has spent all his working life as a student of outdoor geology; after some years with the Geological Survey, he took up the study of the rocks of Anglesey and the adjacent part of Caernarvonshire, and for a quarter of a century devoted his whole time to that work, in which the late Mrs. Greenly played no small part.

The little book is well produced, and in stiff covers at a shilling is very cheap. It would be greatly improved by the addition of a few plates illustrating some of the earth's surface features and the operation of the processes by which rocks have been made and have been destroyed, and the desirability of issuing an illustrated edition at a higher price is worth serious consideration.

F. J. NORTH.

*An Outline of Stellar Astronomy.* By PETER DOIG, F.R.A.S. (The Draughtsman Publishing Co. 7s. 6d.).

The author, Mr. Peter Doig, is well-known to astronomers for his valuable researches on the motions and distribution of the stars, and other matters connected with statistical astronomy, and in this little book he has written an authoritative summary of our present knowledge of the stars. The work is not for the absolute beginner, for it assumes a certain acquaintance with the fundamental facts and definitions of astronomy. Those who already possess a working knowledge of the science will, however, find the book extremely interesting, and will find themselves constantly referring to it.

The book is divided into three sections, of which the first deals with "The Individual Star—Observational Data." In the first chapter of this section are discussed such matters as the dimensions of the stars, their luminosities, masses, densities, etc. Chapter II deals with the movements of the stars, their distribution in space, and their numbers. Chapter III gives an account of double stars, variable stars, and "novae" or temporary stars, with their associated phenomena. The second section is concerned with the nature of a star, its surface and surroundings, the conditions that obtain inside a star, and the course of stellar evolution. Much of the matter dealt with here is so recent that any hypotheses built upon it can

as yet only be regarded as tentative. Where two theories clash, the author in true scientific spirit is careful to present both sides of the argument. The theory of "Giant and Dwarf" stars is very competently handled, Mr. Doig having made this a subject of special study. As most readers will know, he was responsible for the splendid chapter on the same subject in "The Splendour of the Heavens." Section III is devoted to "The Stellar Universe," our own special system, or Galaxy, being dettly treated in the first chapter, while the second chapter is occupied with "External Systems" or Island Universes, as they are occasionally called. A valuable feature of the book is the full list of references appended to each chapter, which will enable the reader to check the statements in the book, and also to extend his studies in any required direction. There is also a series of appendices, consisting mainly of an explanation of the various mathematical formulae employed in astro-physics, with examples of their application. The illustrations, if not numerous, are good, though the fact that they were reproduced through a rather coarse screen has resulted in a slight loss of detail. We have no hesitation, however, in recommending the work to every student of the progress of astronomy.

J. A. LLOYD.

*Art in Greece.* By A. DE RIDDER and W. DEONNA. "History of Civilization Series." (Kegan Paul. 21s.).

"How is it that, wherever Greek products have gone, Greek art has modified age-old traditions, leading all, from one side of the world to the other—Indians and Gallo-Romans alike—to the understanding of an ideal so different from their own? Was this the result of historical hazard, of circumstances external to Greek art? No, it was due to its innate qualities, to its amazing aesthetic and technical superiority." In these sentences from M. Deonna's concluding chapter is indicated the dual cause of the permanent importance of Greek art, its intrinsic excellence on the one hand and its kindling quality on the other. By the former it has given a standard of achievement in artistic matters for all time; from the latter it comes to pass that contact with Greek art has ever meant a quickening of the aesthetic faculties and a stimulus to the production of works of art. The treatment of the subject in this volume is intimately linked with the purpose of the series as a whole, to which all students of man's civilization are deeply indebted. Greek art is studied in relation to the social and political development of the Greek people, as expressing "the collective soul of the people, its aims and its aspirations."

Accordingly the increased individualism and the gradual decline of the idealism of fifth-century Greek art, which begin to be observed in the fourth century, and reach their full effect in Hellenistic and Imperial times, are related to the changing social conditions in a Greece where the citizen no longer held political power, and cosmopolitan influences were increasingly felt.

Similarly in tracing the growth of Greek art up to the masterpieces of the great period, an attempt is made to distinguish the influence of the main ethnic groups of the Greek people, and in Attic art is found the reconciliation of the excessive softness of the Ionians and the too great severity of Doric work.

The technical problems which faced the Greek artist in his progress from primitive conventions to a free expression in his material are excellently dealt with. By his sense of reality and his progressive study of anatomy, the Greek cast off the fetters by which other ancient peoples mostly remained bound in their plastic arts. The stiff frontal postures gave place in a

surprisingly short period to free naturalistic figures. The steps by which this freedom was achieved, and the rhythms which may be detected in single figures and in the composition of metope and pediment, the Greek treatment of drapery and of anatomical detail are all well illustrated by a series of diagrammatic figures. M. Deonna has admirably completed the work originally entrusted to M. de Ridder, whose three chapters, all that was finished before his death, form an introduction to the volume. In that introduction M. de Ridder disclaimed the intention of writing a history of Greek art, which is indeed precluded by the compass of the work, or a philosophy of Greek art, and the book as completed has something of the qualities of both, and forms a valuable introduction to the study of the artistic achievements of Greece, both to the student of Greek life and to the student of aesthetics. The latter will find much to interest him in the foreword of M. Henri Berr, who discusses the function of art in human life. In a work which draws its illustrations from so wide a field as architecture, sculpture, vase painting, and figurines, many questions must be treated in a rather summary fashion, but footnotes supply constant references to the bibliography of over two hundred volumes, which is not the least valuable feature of the book, and will enable the reader to follow up any aspect of the subject in which he is interested. Apart from some sixty figures in the text, the book is illustrated by twenty-four plates, but in some of them (e.g., XX and XXI) the dark technique of the process obscures the detail of the figure, and the reviewer prefers the lighter plates of the original French edition. The translation is a very competent one.

G. F. FORSEY.

*Astronomy.* By H. N. RUSSELL, R. S. DUGAN, and J. Q. STEWART. (Ginn & Co. Two Volumes. 10s. 6d. each).

This excellent book hails from America, and is called a "revision of Young's 'Manual of Astronomy,'" but the revision has been carried out so thoroughly that practically a new work has been produced. Three astronomers of the Princeton University Observatory, each a noted expert in his own line, have collaborated in the work, and this is as it should be. The science of astronomy has grown to such vast proportions that no one person can be expected to have a comprehensive grasp of the whole field. The present authors have done their work well, and the book is an outstanding testimony to their abilities.

The first volume is devoted to the solar system, but commences with matters of fundamental interest. There is a good introduction dealing with the aims and methods of astronomy, its various departments, the relation of astronomy to the other sciences, its value in practical affairs and as a means of culture. A list is given of the principal astronomical journals and publications of observatories which the student will find of great help to him in his studies. Chapter I is concerned with the celestial sphere and definitions of technical terms used in fundamental astronomy. A useful section on the celestial globe and its use in solving astronomical problems is added. Chapter II deals with astronomical instruments of all kinds, and the fine photographs included will enable the reader to obtain a good idea of their construction. Figure 20 is particularly impressive, showing an observer at the great 100-inch reflector at Mount Wilson, the colossal size of the instrument being well brought out. Chapter III deals with practical astronomy, including navigation. Then follow a series of chapters on the earth, sun, moon, planets, etc., which are both scholarly and lucid, a combination not always achieved

by scientific writers. Personally we should like to see more drawings of the planets as illustrations in the book, rather than photographs. Wonderful as are the results of modern astronomical photography, every practical observer knows that in planetary observation, photography is far behind visual work at the telescope. Drawings of the planets by the best observers reveal infinitely more detail than the best photographs ever secured. By this we do not mean that the illustrations are of a poor order, on the contrary, they are very fine. The diagrams also, are extremely clear and elegant.

Volume II deals with "Astrophysics and Stellar Astronomy," commencing with a chapter on "The Analysis of Light," a term which might well serve as a definition of astrophysics. Then follows a wonderfully interesting chapter on the solar spectrum, in which are discussed such matters as the "Evershed effect," the "Einstein shift" of spectrum lines, the "Zeeman effect" in sunspot spectra, and other matters of up-to-date interest. The chapter concludes with a short exposition of Hale's "vortex" theory of sunspots. Then follow chapters on the sun's light and heat, and on the atomic theory in its relation to astrophysics. After which are successively dealt with, the stars, their movements, luminosities, temperatures, diameters, etc., etc. Other chapters are devoted to "Star Clusters and the Milky Way," "Nebulae," "The Constitution of the Stars," and "The Evolution of the Stars."

The mathematics employed are not of a high order, and should not tax the reader unduly. All matters involving the calculus and advanced mathematics have been omitted. A specially valuable feature of the work, from the point of view of the serious student, is the list of questions and references appended to each chapter. The book seems singularly free from errors, though we have noticed one or two slips, possibly the fault of the printer and not of the authors. Altogether this is the best general work on astronomy we have seen for a long time, and the price seems very reasonable. Both authors and publishers are to be heartily congratulated.

J.A.L.

*A New Electronic Theory of Life.* By O. OVERBECK. (Published at Chantry House, Grimsby. 6s.).

That living activity can be expressed in terms of electricity is familiar to those who have followed recent developments in physiology and physics. The author suggests that as ultimately the constituent particles can themselves be resolved

into electric units, the irregularities that arise in the human body are the result of dislocation in this electrically-balanced system. They should therefore be capable of correction by the artificial application of electricity, which it is the purpose of this book to advocate. The efficacy of electric rays in another connexion is illustrated by a reference to the fact that ultra-violet light acting on certain bodies can synthesise vitamins from them, and mention is also made of the quasi-electrical functions of the "hormones."

At the outset of the book a quotation is given from "Atoms and Rays," in which Sir Oliver Lodge states that it is only by treating a subject from many points of view, and by frequent repetition, that it gets any hold on the general mind. "Effective exposition cannot be done crisply and compactly. Room and repetition are needed." This excuses the criticism that the subject under review might have been treated in a shorter space, although it does not justify the frequent overstatements which the author, in his enthusiasm, is led to make. The subject gives rise to interesting considerations, and the book may be summarized by the following passage (page 113): "Superabundance of electricity is associated with happy activity, energy and life, and its insufficiency with sadness, lowness of spirit, and lack of efficiency. These can now . . . be overcome, or at least minimized very greatly. Upon the micro-electric study of ourselves the whole question of our life, health and happiness rests, and it lies with future research to lighten the way."

*The British Museum Quarterly.* 1927. Vol. II. No. 2. (Published by the Trustees. 2s.).

The sixth number of this publication maintains the high standard of its predecessors. The articles include an account of the Ur Excavations Exhibition recently held in the Assyrian Basement section of the museum, when the five thousand-year-old gold dagger and other new treasures were on view. The excellent plates give details of this remarkable find, which was shown in position as discovered with its leather girdle, in the June issue of *Discovery*, while the inlaid gaming board and plaster plaque are also beautifully illustrated. Another interesting contribution deals with an Egyptian leather roll containing hieratic writing, which has never till now been unrolled owing to its brittleness. The details of how this delicate process was carried out successfully afford an interesting insight "behind the scenes" in a museum laboratory.

## Books Received.

*Man, Spirit, Angel.* By THE REV. G. A. SEXTON. (A. H. Stockwell Ltd. 6s.).

*A Short History of Western Civilization.* By A. F. HATTERSLEY. (Cambridge University Press. 6s.).

*Mind and Life from Atom to Man.* By ALBERT DAWSON. (The C.W. Daniel Company. 15s.).

*Lectures on Theoretical Physics.* By H. A. LORENTZ. (Macmillan & Co. Ltd. 21s.).

*The Antiquity of Man in East Anglia.* By J. REID MOIR. (Cambridge University Press. 15s.).

*Psychology and the Soldier.* By F. C. BARTLETT. (Cambridge University Press. 7s. 6d.).

*Annals of Archaeology and Anthropology.* Issued by the Institute of Archaeology. Edited by J. P. DROOP and T. E. PEET. Vol. XIV. Nos. 3-4. (Liverpool: The University Press. London: Hodder & Stoughton Ltd.).

*That Mind of Yours.* By DANIEL B. LEARY, Ph.D. (J. B. Lippincott Company. 6s.).

*The Opposite Sexes.* By DR. ADOLF HEILBORN. Translated by J. E. PRYDE-HUGHES. (Methuen & Co. Ltd. 6s.).

*Physics in Industry.* Vol. V. By H. E. WIMPERIS, O.B.E., M.A., F.R.A.S., and F. E. SMITH, C.B., C.B.E., D.Sc., F.R.S. (Oxford University Press. 2s. 6d.).

*Possible Worlds, and other Essays.* By J. B. S. HALDANE. (Chatto & Windus. 7s. 6d.).

*Centenary Addresses.* With a preface by DR. R. W. CHAMBERS. (University of London Press Ltd. 12s. 6d.).

*Archimedes, or the Future of Physics.* By L. L. WHITE. (Kegan Paul, Trench, Trubner & Co. Ltd. 2s. 6d.).

*The Great Physicist's.* By IVOR B. HART, O.B.E., Ph.D., B.Sc. (Methuen & Co. Ltd. 3s. 6d.).

*Collected Papers of Srinivasa Ramanujan.* Edited by G. H. HARDY, P. V. SESHU AIYAR, and B. M. WILSON. (Cambridge University Press. 30s.).

*Annual Report of the Smithsonian Institution, 1926.* (U.S. Government Printing Office, Washington. 1927).

*Sport and Travel in the Highlands of Tibet.* By SIR HENRY HAYDEN and CESAR COSSON. (R. Cobden-Sanderson. 21s.).

*Making up One's Mind.* By W. ROBERTS. (The C.W. Daniel Company. 2s.).



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